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UPDATED CATCHES OF SHARKS

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Summary

This document presents updated commercial and recreational catch estimates of Atlantic sharks up to 2001, with special emphasis on sharks of the Large Coastal complex. Species-specific information on the geographical distribution of both commercial and recreational catches is presented along with the different gear types used in the commercial fisheries. Length-frequency information and average weights of the catches in three separate recreational surveys and in the directed shark bottom-longline observer program are also included.

BACKGROUND

U.S. Atlantic shark catches increased rapidly during the late 1980's and early 1990's to more than 9,500 mt, but were limited by a suite of regulations including commercial quotas and recreational bag limits. Because species-specific catches of sharks were generally not documented by all states until 1994, they were grouped by similar life-history and habitat characteristics for the purpose of management. Most of the recent U.S. catch of sharks for the market is of species grouped as large coastal sharks (LCS), both ridgeback (e.g., sandbar, dusky, silky, tiger) and non-ridgeback (e.g., blacktip, bull, lemon, spinner). Some pelagic sharks (e.g., mako, thresher, porbeagle) are also valued by U.S. fishers targeting tunas and swordfish. Four species of small coastal sharks (Atlantic sharpnose, bonnethead, blacknose, and finetooth) are also regularly landed in commercial fisheries and caught by recreational fishers.

Estimates of total catch and dead discarded large coastal sharks for the period 1981-1997 were summarized in Table 2 of the 1998 Report of the Shark Evaluation Workshop (NMFS 1998). They were later updated and extended to include 1998 and 1999 in Table 1 of the 1999 and 2000 Shark Evaluation Annual Reports, respectively (Cortés 1999, 2000). The present report provides updated or revised catch information for 1999-2000 and preliminary estimated catches for 2001, which are presented in Table 1 herein. Species-specific commercial and recreational landings are also presented for the three management groups as well as catch histories for the blacktip and sandbar sharks. Geographical information on the commercial and recreational catches and a breakdown of the gear used in commercial fisheries is presented. Length-frequency information and average weights of the catches in three separate recreational surveys and in the directed shark bottom-longline observer program are also included.

1. Commercial Landings

As has been reported previously, the U.S. commercial shark fishery is primarily a southern coastal fishery extending from North Carolina to Texas. About 84-91% of 1998-2001 U.S. Atlantic shark landings, excluding dogfish, came from the southeastern region. Approximately 84-91% of large coastal sharks, between 56-64% of pelagic sharks, and essentially the totality of small coastal sharks came from the southeastern region, whereas about 90% of all "dogfish" were landed in the northeastern region. Among large coastal sharks, the most sought-after species in this fishery are blacktip and sandbar sharks, although others are also taken (NMFS 1998, Cortés 1999, 2000). Shortfin mako and thresher sharks are the two pelagic species more frequently landed, and among small coastal sharks, four species (Atlantic sharpnose, blacknose, finetooth, and bonnetheads) are regularly harvested.

U.S. commercial landings of Atlantic sharks in 1996-2001 were compiled based on Northeast Regional and Southeast Regional general canvass landings data, and the SEFSC quota monitoring data based on southeastern region permitted shark dealer reports. Landings prior to 1996 were taken as reported in NMFS (1998). Landings in southeastern states reported in the general canvass and quota monitoring data files were combined to define the species composition and volume of landings.

The quota monitoring data provide a more diverse species listing than the general canvass data, whereas the general canvass data apportion a higher volume of shark landings as unclassified. The larger reported landing of a given species in the two data sets was taken as the actual landed volume for that species. The positive difference between the quota monitoring data and the general canvass data was then subtracted from the unclassified sharks category of the general canvass data to maintain the total landings volume equal to that reported in the general canvass data files. For the state of North Carolina (NC), it was assumed that some "dogfish" may have also been assigned to the unclassified sharks category. To adjust for this possibility for the state of NC, the NC unclassified sharks were first apportioned between the large coastal, small coastal, pelagic and dogfish categories based on the reported distribution of landings by species

and gear for that state. For states other than NC, the remainder of unclassified shark landings was assigned to the large coastal group unless the harvesting gear was pelagic longline, in which case the landings were assigned to the pelagic group. The updated commercial landings estimates for 2000 and preliminary estimates for 2001 are shown in Table 2. Estimates for 2001 from the Southeast general canvass data do not include landings in August-December for Florida and June-December for Georgia as the estimates for those months were not yet available. Data for Alabama and Louisiana were available for the whole year but are preliminary, and Puerto Rico landings are included in both the 2000 and 2001 estimates from the Southeast general canvass data.

Data from the quota monitoring system reveal that in 1998 about 50% of large coastal sharks were landed in Louisiana and about one third in Florida (east and west coasts), while North Carolina accounted for 11% of total LCS landings. In 1999, LCS landings in Louisiana made up about one third of the total, Florida landings accounted for about 45%, and North Carolina for about 18% of the total LCS landings. In 2000, Florida also accounted for the largest proportion of LCS landings (58%), followed by Louisiana (14%), North Carolina (12%), and Texas (10%). In 2001, Florida accounted again for the largest proportion of LCS landings (56%), followed by Texas (19%) and South Carolina (13%).

Pelagic sharks were mostly landed in North Carolina in 1998 and 1999 (57% and 48%, respectively), Florida (23% and 38%, respectively), and Louisiana (15% and 7%, respectively). In 2000, pelagic sharks were landed in almost equal proportions in Florida and North Carolina (33% and 34%, respectively), followed by South Carolina (10%) and Louisiana (8%). In 2001, most pelagic sharks were landed in Florida (56%), followed by Texas (19%) and South Carolina (13%). Most small coastal sharks were landed in Florida's east coast in 1998, 1999, 2000, and 2001 (93%, 80%, 69%, and 61%, respectively), the majority of which were caught with drift gillnet gear. New York accounted for 10%, 21%, and 30% of total SCS landings in 1999, 2000, and 2001, respectively.

Total commercial landings of large coastal sharks in 1998-2001 exceeded the allowed quotas. This can be attributed to state landings occurring after each of the two federal semi-annual season closures. For example, according to SE general canvass data, 1998 Louisiana landings (mostly of unclassified sharks likely to belong to the LCS complex) after the first semi-annual season closure amounted to about 679,000 lb dw (308 mt dw). Total landings of large coastal and pelagic sharks in 1999-2001 were lower than in 1998. Landings of small coastal sharks were higher in 1999 and 2001 than in 1998, but lower in 2000 than in 1998. Lower LCS landings in 1999-2001 can be due, at least in part, to a closed season for the commercial harvest of sharks in waters of the state of Louisiana between April 1 and June 30, which was implemented in 1999.

Longlines were the primary gear type used in all regions to catch large coastal sharks from 1987 to 2001. Gillnets were the second-most common gear utilized, followed by lines (Tables 3-12). Blacktip and sandbar sharks were predominantly caught in the Gulf of Mexico region and predominantly caught using longline gear (Figures 1

and 2; Tables 3-6). Dusky sharks were primarily taken in the Mid-Atlantic region using longline gear (Figure 3; Tables 7 and 8), whereas the hammerhead shark complex was taken in all regions with slightly greater landings in the South Atlantic region (Figure 4; Tables 9 and 10). The unclassified shark fin category was also taken mainly using longline gear, and landings corresponded mostly to the Gulf of Mexico and South Atlantic regions (Figure 5, Tables 11 and 12).

2. Bottom-Longline Shark Fishery Observer Program Information

As has been reported previously (NMFS 1996, 1998; Cortés 1999, 2000) information from observer sampling on board directed effort commercial shark vessels (formerly run jointly by the Gulf and South Atlantic Fisheries Development Foundation and the University of Florida [SB-IV-1,2,3] and presently by the University of Florida alone) was summarized to obtain estimates of the average size of sharks harvested by the commercial fleet. Differences in predicted (obtained by back-transforming from fork lengths) and observed sample weights were reported previously and attributed mainly to the opportunistic nature of weight measures taken during the observer program. This generally resulted in substantially fewer direct weight measurements than length measurements, and almost no weights being taken starting in 1999 (G. Burgess, U. of Florida, pers. comm.). For this evaluation update, average weights were calculated from lengths of sharks measured during the survey by applying length-weight regressions summarized in SB-III-5 and in other published and unpublished sources. It is assumed that average weights predicted from length are a closer approximation to the actual dressed weights of sharks caught in the commercial fishery and thus the estimates in Table 1 are calculated based on predicted weights.

The predicted average weight for the LCS complex was 32.76 lb dw (14.86 kg, n=2,912) in 1996, 30.53 lb (13.85 kg, n=2,238) in 1997, 26.21 lb (11.89 kg, n=4,451) in 1998, 34.66 lb (15.72 kg, n=2,856) in 1999, 33.38 lb (15.14 kg, n=513) in 2000, and 35.90 lb (16.28 kg, n=3,711) in 2001. The average weight of the LCS complex observed in the shark bottom longline observer program has remained relatively stable over the nine-year data set (1993–2001; Figure 6). The average weight and length of blacktip sharks has increased steadily from 1994 to 2001, although the last two years of data had smaller sample sizes (Figure 7). Sandbar sharks showed a decreasing average weight from 1993 to 1998, with an increase to 2000, followed by a decrease in 2001 towards a value similar to that observed in 1994 and 1995 (Figure 8). The small sample size must be noted along with the peak average weight observed in 2000.

Using this updated average size information, the estimated U.S. commercial landings of Atlantic LCS were 2,387 mt dw (about 160,600) in 1996, 1,809 mt (130,600 fish) in 1997, 2,080 mt (174,900 fish) in 1998, 1,753 mt (111,500 fish) in 1999, 1,684 mt (111,200 fish) in 2000, and 1,616 mt (99,200 fish) in 2001. These levels represent a reduction from peak recorded commercial landings (about 4,600 mt, approximately 350,000 fish in 1989; SB-III-6) of this grouping of sharks. Commercial catches of LCS in numbers in 1996, 1997, 1998, 1999, 2000, and 2001 are estimated to be about 72%,

59%, 79%, 50%, 50%, and 45%, respectively, of those in 1995 (Table 1). Catches in numbers for 1999 and 2000 are estimated to be about 36% lower than 1998 catches, and those for 2001, 43% lower than 1998 catches.

3. Recreational Harvest Estimates

Recreational fishing for sharks also results in significant harvests of large coastal and other shark species (SB-III-5). Recreational harvest of sharks occurs all along the U.S. Atlantic and Gulf of Mexico coasts. Recreational fishing estimates were obtained, as previously reported, from three data collection programs: the Marine Recreational Fishing Statistics Survey (MRFSS), the NMFS Headboat Survey (HBOAT) operated by the SEFSC Beaufort Laboratory, and the Texas Parks and Wildlife Recreational Fishing Survey (TXPWD). In 1998, 94% and 99% of the total recreational reported harvest of large coastal and pelagic sharks, respectively, came from MRFSS, whereas for small coastal sharks, 47% of the reported harvest came from MRFSS, 36% from TXPWD, and 17% from HBOAT.

The majority of recreational LCS landings from 1981-2001 occurred in the Gulf of Mexico region (52%), followed by the South Atlantic region (33%; Figure 9). The South Atlantic region contributed 15% of the catch. Figure 10 shows recreational catches by region for selected large coastal shark species. Blacktip (75%) and bull (62%) sharks were taken primarily in the Gulf of Mexico, whereas scalloped hammerhead (72%) and great hammerhead (57%) sharks were taken mostly in the South Atlantic region. Dusky (52%) sharks were taken mainly in the Mid-Atlantic region. Sandbar sharks were taken in fairly similar proportions in the Mid-Atlantic and South Atlantic regions.

Recreational harvests of LCS were estimated to be on the order of 176,000, 188,500, 165,000, and 170,000 fish in 1995, 1996, 1997, and 1998, respectively (Table 1). In 1999, including catches from the HBOAT and TXPWD surveys which were not available for the 2000 evaluation, an estimated 91,000 LCS were landed by the recreational sector. In 2000, an estimated 132,000 LCS were reported by MRFSS, in contrast to the almost 160,000 and 84,000 reported in this survey in 1998 and 1999, respectively. Catches from the TXPWD survey for 2000 (an estimated 4,800 fish) were similar to those reported for 1999 (4,200). Assuming that LCS catches from the HBOAT survey were equal to those reported in 1999 (about 3,000), the total estimated recreational catches for 2000 are on the order of 137,400 LCS (Table 1). The more recent estimates (1994-2001) are considerably lower than those from 1981-1993. Additionally, from 1995 to 2001, about 23,000, 27,000, 15,000, 9,000, 7,000, 11,000, and 24,000 unidentified sharks, respectively, were estimated to have been harvested by the recreational fishery, some of which might have been large coastal sharks. Recreational catches of large coastal sharks in numbers in 2001 are estimated to be 80%, 75%, 86%, 84%, 156%, and 101% of those in 1995, 1996, 1997, 1998, 1999, and 2000, respectively. The 1996, 1997, 2000, and 2001 recreational catch estimates in numbers were greater than those from the commercial sector, whereas the 1998 and 1999 estimates were lower (Table 1). Recreational harvest estimates are shown in Table 13.

Length-frequency distributions were constructed for selected species for each of the three recreational surveys. Blacktip, sandbar, and dusky shark length-frequency distributions were constructed from the MRFSS survey data. Blacktip and sandbar sharks were observed from 1982 through 2001, with the majority of the observed sharks being smaller than 110 cm TL (Figures 11 and 12). Dusky sharks were observed intermittently from 1981 to 1997 and most years contained few individuals (Figure 13). Length-frequency distributions were constructed for the blacktip and spinner sharks utilizing Headboat survey data. Blacktip sharks were observed between 1986 and 1999, with a greater size range observed than in the MRFSS survey (Figure 14). Spinner sharks were observed in all years except 1992 and 1993 (Figure 15). Blacktip shark length-frequency distributions were also constructed using the Texas Parks and Wildlife survey data (Figure 16). This was the only species of large coastal shark with enough data for an analysis. Again, the majority of the sharks were less than 110 cm TL.

The average weight and length of the LCS complex observed in the MRFSS has remained relatively stable over the 21-year data set (1981–2001; Figure 17). The average weight and length of blacktip sharks fluctuated between approximately 3-6 lb dw and 70-90 cm TL, respectively, during 1988-2001 (Figure 18). Sandbar shark average weight and length decreased slightly over the period 1982-2000, with a peak in 2001 (Figure 19). It must be noted that the samples sizes are relatively small, especially for the sandbar shark. The average weight and length of dusky sharks decreased greatly since 1981, but the sample sizes are also very small (Figure 20).

The Headboat survey data indicate that the average weight of LCS has decreased since 1986, and has been fairly stable since 1990, with a slight increase in 1999 (Figure 21). Data for the blacktip shark mirror this trend, except for a large increase in 2000, although the sample size for that year was only two sharks (Figure 22). Data for the sandbar and spinner sharks indicate that the average weight and length have remained stable from 1988 to 1998, but the sample sizes for these species are also very small (Figures 23 and 24).

No discernible trend is evident for either the LCS complex or for the blacktip shark from the Texas Parks and Wildlife Department survey (Figures 25 and 26). There may be an increasing trend in average weight and length starting in 1996 and 1997 for the LCS complex and blacktip, respectively.

4. Bycatch and Discard of Sharks

As reported in NMFS (1996, 1998) and Cortés (1999, 2000), bycatch of sharks occurs in many fisheries, including trawl, set-net, and hook and line fisheries. For instance, in the Gulf of Mexico, shark bycatch by the U.S. shrimp trawl fleet consists mainly of sharks too small to be highly valued in the commercial market (SB-III-23). Bycatch of sharks in trawl and other fisheries outside of the Gulf of Mexico also likely occurs with regularity.

Pelagic longline fisheries targeting swordfish and tunas can, at times, have shark bycatches that exceed the targeted species catch. In the U.S. longline and drift gillnet fisheries, logbook and scientific observer reports indicate shark bycatch varies with target species (e.g., yellowfin tuna, bigeye tuna or swordfish), gear characteristics and fishing season. Estimates of the annual dead discarded tonnage of large coastal sharks by U.S. pelagic longline fisheries between 1987 and 1995 range from about 140-875 mt (approximately 6,000-21,000 fish; SB-III-4). For 1996, 1997, and 1998 approximately 5,700, 5,600, and 4,300 large coastal sharks, respectively, were estimated to have been discarded dead by these fleets (SB-IV-22, SB-IV-33). In 1999 and 2000, 9,000 and 9,400 fish, respectively, were estimated as dead bycatch (Cramer 2000; unpublished data).

Updated and revised observer data collected from the directed bottom-longline shark fishery (SB-IV-1, 2, 3 and G. Burgess, U. of Florida, pers. comm.) indicate that large coastal sharks discarded from the fishery represented about 5.7% of the total mortality attributable to the LCS grouping harvested by the fishery from 1994 to 2001. These discard rates include sharks discarded dead and also those used for bait. The fraction of large coastal sharks discarded was 7.2%, 6.2%, 4.8%, 6.4%, 5.7%, 3.4%, 4.3%, and 6.4% for 1994, 1995, 1996, 1997, 1998, 1999, 2000, and 2001, respectively. Observer data collected from the Gulf of Mexico menhaden fishery operating mainly off Louisiana for the period 1994-1995 (de Silva et al. 2001) indicated that 75% of the sharks encountered in this fishery died; 97% were large coastal and 3% were small coastal sharks. The total number of sharks caught by this fishery was estimated to be about 36,000 in 1994 and 33,000 in 1995, or about 26,200 (36,000×0.75×0.97) and 24,000 large coastal sharks discarded dead in 1994 and 1995, respectively. The average number of large coastal sharks caught in this fishery during 1994-95 (25,100 fish) was used as an estimate for subsequent years (1996-2001; Table 1).

5. Species-Specific Catch Histories

For the purpose of development of species-specific assessments, estimates of the historical catch time series for blacktip and sandbar sharks were prepared based on estimated area- and gear-specific landings by year. Estimated catches of blacktip (Table 4) and sandbar (Table 5) sharks were based on the proportional allocation of commercial landings of unclassified sharks by gear type and region defined in NMFS (1996) for the period 1986-1995 and using the species breakouts defined in SB-IV-12 for 1996, in Table 2 of Cortés (1999) for 1997, in Table 2 of Cortés (2000) for 1998 and 1999, and in Table 2 herein for 2000 and 2001. Unclassified sharks in 1996-2001 attributed to the LCS grouping were proportionally allocated to sandbar and blacktip sharks, respectively, based on the species-specific landings identified in SB-IV-12, Table 2 in Cortés (1999), Table 2 in Cortés (2000), and Table 2 herein.

As in previous reports, unreported landings were based on the assumed proportions of the values reported in Table 1 of SB-IV-12: 75% blacktip and 25% sandbar for the period 1986-1987, and 50% blacktip, 50% sandbar for the period 1988-1991. Species-specific recreational catches are as reported in SB-III-7, SB-IV-12, Cortés

(1999, 2000), and in Table 3 herein for 1999, 2000, and 2001. Levels of dead discarded blacktip and sandbar sharks are assumed to be negligible for U.S. pelagic longline fisheries. Average weights for these species caught in commercial fisheries are taken as predicted weights from length measures from revised estimates of observer data in the directed longline fishery for the period 1994-2001. Prior to 1994, values assumed are indicated (Tables 4 and 5). Estimates of numbers of sharks caught and landed by the directed commercial fleet are taken as estimates of lb (dressed) landed/average wt (dressed lb). Mexican catches are as reported in Table 4 of the 1998 SEW report, with catches for 1999-2001 assumed to be equal to those in 1993-1998.

Bycatch of blacktip and sandbar sharks in the Gulf of Mexico menhaden fishery (de Silva et al. 2001) was also incorporated in this assessment following the rationale presented in Cortés (1999, 2000), in which blacktip sharks were assumed to represent 45.3%, and sandbar sharks 1.8%, of the total bycatch observed during 1994-95. Considering the reported 75% mortality rate among all sharks, this results in an estimated bycatch of 12,200 (36,000×0.453×0.75) and 11,200 dead blacktip sharks, and 486 and 445 sandbar sharks, in 1994 and 1995, respectively. The averages of the 1994 and 1995 values (11,700 fish for blacktip sharks and 465 fish for sandbar sharks) were used as estimated dead bycatch for 1996-2001.

REFERENCES

Cortés, E. 1999. 1999 Shark Evaluation Annual Report.

Cortés, E. 2000. 2000 Shark Evaluation Annual Report. 23 pp.

Cramer, J. 2000. Pelagic longline bycatch. Col. Vol. Sci. Pap. ICCAT 51. pp. 1895-1930.

Cramer, J. Pelagic longline bycatch. Unpublished data.

De Silva, J.A., R.E. Condrey, and B.A. Thompson. 2001. Profile of sharks associated with the U.S. Gulf menhaden fishery. North American Journal of Fisheries Management.

NMFS (National Marine Fisheries Service). 1996. 1996 Report of the Shark Evaluation Workshop.

NMFS (National Marine Fisheries Service). 1998. 1998 Report of the Shark Evaluation Workshop. 109pp.

SB-III-4. Cramer, J. 1996. Estimates of the numbers and metric tons of sharks discarded dead by pelagic longline vessels. Document presented at the 1996 Shark Evaluation Workshop.

SB-III-5. Scott, G. P., P. J. Phares, and B. Slater. 1996. Recreational catch, average size and effort information for sharks in US Atlantic and Gulf of Mexico waters. Miami Lab. Contrib. ML-95/96-44.

SB-III-6. Poffenberger, J. Commercial shark landings. Document presented at the 1996 Shark Evaluation Workshop.

SB-III-7. Poffenberger, J. Shark logbook data. Document presented at the 1996 Shark Evaluation Workshop.

SB-III-9. Ulrich, G. F. 1996. Fishery independent monitoring of large coastal sharks in South Carolina (1993-1995).
SB-III-23. Pellegrin, G. 1995. By-catch estimates and estimates of relative abundance for sharks. Document presented at the 1996 Shark Evaluation Workshop.
SB-IV-1. Branstetter, S. and G. Burgess. Gulf and South Atlantic Fisheries Development Foundation and University of Florida. Commercial shark fishery observer program 1996. Document presented at the 1998 Shark Evaluation Workshop.
SB-IV-2. Branstetter, S. and G. Burgess. Gulf and South Atlantic Fisheries Development Foundation and University of Florida. Commercial shark fishery observer program 1997-1998. Document presented at the 1998 Shark Evaluation Workshop.
SB-IV-3. Branstetter, S. and G. Burgess. Gulf and South Atlantic Fisheries Development Foundation. Monitoring the large coastal shark stock of the western Gulf of Mexico. Document presented at the 1998 Shark Evaluation Workshop.
SB-IV-12. Scott, G., J. Bennett, B. Slater, and P. Phares. 1998. Recent recreational and commercial catches of sharks along the US east and Gulf of Mexico coasts. Sust. Fish. Div. Contrib. SFD-97/98-11. Document presented at the 1998 Shark Evaluation Workshop.
SB-IV-22. Cramer, J., A. Bertolino, and G. P. Scott. 1997. Estimates of recent shark bycatch by U.S. vessels fishing for Atlantic tuna and tuna-like species. ICCAT Working Document SCRS/97/58. Document presented at the 1998 Shark Evaluation Workshop.
SB-IV-31. Cramer, J., and H. M. Adams. 1998. Pelagic longline bycatch. Sust. Fish. Div. Contrib. SFD-97/98-06. Document presented at the 1998 Shark Evaluation Workshop.
SB-IV-33. Cramer, J., and H. M. Adams. 1998. Pelagic longline bycatch. Sust. Fish. Div. Contrib. SFD-97/98-06. Document presented at the 1998 Shark Evaluation Workshop.

Table 1. *Estimates of total landings and dead discards for large coastal sharks (numbers of fish in thousands), modified from 1998 Report of the Shark Evaluation Workshop (NMFS 1998) and 1999 and 2000 Shark Evaluation Annual Reports (Cortés 1999, 2000).*

Year	Col 1 Commercial Landings	Col 2 Longline Discards	Col 3 Rec. Catches	Col 4 Unre-ported	Col 5 Coastal Discards	Col 6 Menhaden Fishery Bycatch	Col 7 Total
81	16.2	0.9	265.0				282.1
82	16.2	0.9	413.9				431.0
83	17.5	0.9	746.6				765.0
84	23.9	1.3	254.6				279.8
85	22.2	1.2	365.6				389.0
86	54.0	2.9	426.1	24.9			507.9
87	104.7	9.7	314.4	70.3			499.0
88	274.6	11.4	300.6	113.3			699.9
89	351.0	10.5	221.1	96.3			678.8
90	267.5	8.0	213.2	52.1			540.8
91	200.2	7.5	293.4	11.3			512.4
92	215.2	20.9	304.9				541.1
93	169.4	7.3	249.0		11.3		437.0
94	228.0	8.8	160.9		16.3	26.2	440.2
95	222.4	5.2	176.3		13.9	24.0	441.8
96	160.6	5.7	188.5		7.6	25.1	387.5
97	130.6	5.6	165.1		8.3	25.1	334.7
98	174.9	4.3	169.8		9.9	25.1	384.0
99	111.5	9.0	91.0		3.8	25.1	240.4
00	111.2	9.4	140.4		4.8	25.1	290.9
01	99.2	9.4	142.0		6.3	25.1	282.0

Column 1, commercial landings - These data are the landings reported under the established NMFS cooperative statistics program. (See document SB-III-6 for a description of this data collection program.) The data are collected in landed or dressed weight. Various sources of weight per fish estimates were used to convert pounds to numbers of fish. For the period 1981 through 1985, a generic factor of 45 pounds dressed weight per fish was used. For 1986 through 1991, an average weight for all species was used. These averages are the ones that were used in the 1992 assessment. For 1992 and 1993, average weights for coastal species observed in longline catches were used in document SB-III-6, but the group felt that these weights were too high to apply to fish caught nearer shore in the directed large coastal fishery. Therefore, a weight of 40 pounds per fish was used for these two years. For 1994 and 1995, predicted weights from lengths based on the observer program (Branstetter and Burgess 1997) and data from the pelagic longline database were used. Average weights used for 1996-2001 came from the shark bottom longline fishery observer program and are given in the text.

Column 2, pelagic longline discards - The data for this column are from the analyses of the discards by pelagic longline vessels (see document SB-III-4). The estimates prior to 1987 are calculated using the average ratio of the discards to commercial landings for the data for 1987 through 1992 (discards as a fraction of combined landings and discards averaged 5.12% over this period). Estimates for 1993-2000 are from SB-III-4, SB-IV-22, SB-IV-33, and Cramer (1999, 2000,2001). The estimate for 2001 was not yet available and it was set equal to that for 2000.

Column 3, recreational harvest - These data are updated from data originally reported in document SB-III-5 and include estimated catches from the NMFS MRFSS, Headboat and charter boat surveys and the Texas Parks and Wildlife (TPWD) recreational creel survey. The estimate for 2000 is based on catches reported from MRFSS and TXPWD, and assuming that catches from the Headboat survey were the same as those reported for 1999 since catches from that source were not yet available for 2000. The estimate for 2001 is based on catches reported from MRFSS only, and assuming that catches from the Headboat survey were the same as those reported for 1999 and the catches from TXPWD were the same as those reported for 2000.

Column 4, unreported catches - These data are from a single source, which owned a fleet of vessels that fished in the Gulf of Mexico and off the coast of North Carolina. The estimate for 1988 was determined from company landings records. The estimates for other years were prorated based on the 1988 landings record and financial statements indexing income from shark fishing (SB-III-30). The Working Group did not have any way of determining the amount, if any, of these catches that were included. Therefore, the Working Group made the assumption that none of the catches were included and kept these data separate, listing them as unreported. The implicit assumption in doing this is that the landings were off-loaded in Alabama docks, but not sold to Alabama dealers.

Column 5, discards by coastal fishery - These data are from the Gulf and South Atlantic Fisheries Development Foundation/University of Florida observer program (SB-IV-1,2,3 and G. Burgess, pers. comm.). Revised estimates show that 7.2% and 6.2% of large coastal species were discarded by the directed fishery in 1994 and 1995. The calculated percentages for 1994 and 1995 were averaged (6.7%) and applied to the recorded landings for 1993 to give an estimate of the discards in 1993. Discard rates of 4.8%, 6.4%, 5.7%, 3.4%, 4.3%, and 6.4% were applied in 1996, 1997, 1998, 1999, 2000, and 2001, respectively, based on the whole dataset (G. Burgess, U. of Florida, pers. comm.). The discarded species are non-marketable animals that are included in the LCS management unit.

Column 6, bycatch by menhaden fishery - These data are bycatch estimates of large coastal sharks in the US Gulf of Mexico menhaden fishery for 1994-95 (de Silva et al. in review). It was estimated that 75% of the sharks encountered died and that about 97% of all sharks observed were large coastal sharks. The average for 1994 and 1995 was used as an estimate for 1996-2001.

Column 7, total - The numbers in this column are the sum of columns 1-6.

Table 2. *Estimated U.S. Atlantic shark landings in 2000 and 2001 for the Large and Small Coastal and Pelagic Management Groups. All landings are dressed weights.*

Large Coastal Sharks	Landed lbs	**Small Coastal Sharks**	Landed lbs	**Pelagic Sharks**	Landed lbs
2000:		**2000:**		**2000:**	
Shark, bignose	672	Shark, Caribbean sharpnose	353	Shark, bigeye thresher	4,376
Shark, blacktip	1,633,919	Shark, angel	86	Shark, blue	3,508
Shark, bull	24,980	Shark, Atlantic sharpnose	142,511	Shark, shortfin mako	129,088
Shark, dusky	205,746	Shark, blacknose	178,083	Shark, longfin mako	6,560
Shark, hammerhead	35,060	Shark, bonnethead	69,411	Shark, mako	74,690
Shark, lemon	45,269	Shark, finetooth	202,572	Shark, oceanic whitetip	657
Shark, nurse	429	Shark, unc	11	Shark, porbeagle	5,272
Shark, sand tiger	6,554			Shark, thresher	81,624
Shark, sandbar	1,491,908			Shark, unc	41,184
Shark, sandbar, fins	996			Shark, unc, fins	3,746
Shark, silky	31,959				
Shark, spinner	14,473				
Shark, tiger	24,443				
Shark, unc	108,692				
Shark, unc, fins	86,824				
Shark, white	1,201				
Total:	3,713,125 (1,684 mt)	Total:	593,027 (269 mt)	Total:	350,705 (159 mt)
2001:		**2001:**		**2001:**	
Shark, bignose	1442	Shark, Caribbean sharpnose	205	Shark, bigeye thresher	330
Shark, blacktip	1,135,199	Shark, Atlantic sharpnose	195,257	Shark, blue	65
Shark, bull	27,037	Shark, Atl. Sharpnose, fins	209	Shark, shortfin mako	173,143
Shark, dusky	871	Shark, blacknose	160,990	Shark, longfin mako	12,930
Shark, dusky, fins	89	Shark, bonnethead	62,980	Shark, mako	73,556
Shark, hammerhead	69,355	Shark, finetooth	299,788	Shark, oceanic whitetip	922
Shark, large coastal	172,494	Shark, unc	55	Shark, porbeagle	1,208
Shark, lemon	24,453			Shark, porbeagle, fins	12
Shark, nurse	387			Shark, thresher	56,893
Shark, sand tiger	1,248			Shark, thresher, fins	201
Shark, sandbar	1,404,360			Shark, unc	31,639
Shark, sandbar, fins	2364			Shark, unc, fins	12,026
Shark, silky	14,197				
Shark, spinner	6,970				
Shark, tiger	26,973				
Shark, unc	569,605				
Shark, unc, fins	105,475				
Shark, white	26				
Total:	3,562,546 (1,616 mt)	Total:	719,484 (326 mt)	Total:	362,925 (165 mt)

Table 3. Percentage of blacktip shark commercial landings by gear for all years combined. (Years listed under each region indicate those used in the summary calculation.)

	Region		
Gear	**Gulf of Mexico** (1987 - 2001)	**Mid Atlantic** (1987 - 2001)	**South Atlantic** (1991 - 2001)
Diving	0.00	0.00	0.01
Gillnets	6.10	19.24	26.78
Lines	1.63	10.72	3.19
Longlines	36.85	66.02	69.38
Other	43.22	0.10	0.14
Other nets	0.11	0.00	0.07
Other trawl	0.00	0.00	0.00
Otter trawl	0.33	1.62	0.40
Pots & traps	0.04	0.01	0.00
Purse seine	0.01	0.09	0.00
Unknown	11.71	2.19	0.03

Table 4. Percentage of blacktip shark commercial landings by region for all gear combined.

	Region		
Year	**Gulf of Mexico**	**Mid Atlantic**	**South Atlantic**
1987	85.94	14.06	0.00
1988	99.96	0.04	0.00
1989	99.64	0.36	0.00
1990	94.27	5.73	0.00
1991	34.13	38.76	27.11
1992	35.39	28.59	36.02
1993	44.40	16.00	39.60
1994	55.24	2.85	41.92
1995	46.98	8.48	44.54
1996	49.62	2.93	47.45
1997	47.01	0.89	52.10
1998	58.50	4.47	37.03
1999	86.92	2.13	10.95
2000	61.24	5.74	33.01
2001	69.05	0.21	30.73

Table 5. Percentage of sandbar shark commercial landings by gear for all years combined. (Years listed under each region indicate those used in the summary calculation.)

	Region		
Gear	**Gulf of Mexico** (1991 - 2001)	**Mid Atlantic** (1989 - 2001)	**South Atlantic** (1991 - 2001)
Diving	0.10	0.00	0.00
Gillnets	0.11	30.12	2.73
Lines	3.15	1.27	1.30
Longlines	96.17	61.55	95.81
Other	0.44	0.00	0.02
Other nets	0.02	0.50	0.03
Other trawl	0.00	0.00	0.00
Otter trawl	0.01	5.61	0.11
Pots & traps	0.00	0.00	0.00
Purse seine	0.00	0.00	0.00
Unknown	0.00	0.96	0.00

Table 6. Percentage of sandbar shark commercial landings by region for all gear combined.

	Region		
Year	**Gulf of Mexico**	**Mid Atlantic**	**South Atlantic**
1987	100.00	0.00	0.00
1988	94.37	0.00	5.63
1989	6.18	93.82	0.00
1990	0.00	100.00	0.00
1991	91.85	6.61	1.55
1992	66.73	11.93	21.34
1993	85.62	10.22	4.16
1994	68.46	3.46	28.08
1995	58.11	3.75	38.14
1996	49.27	4.10	46.63
1997	49.67	3.53	46.80
1998	51.49	2.59	45.92
1999	33.89	3.92	62.18
2000	44.95	5.05	50.01
2001	54.55	2.95	42.50

Table 7. Percentage of dusky shark commercial landings by gear for all years combined. (Years listed under each region indicate those used in the summary calculation.)

	Region		
Gear	**Gulf of Mexico** (1991 - 2001)	**Mid Atlantic** (1988 - 2001)	**South Atlantic** (1991 - 2001)
Diving	0.00	0.00	0.00
Gillnets	0.03	29.92	1.47
Lines	7.79	0.55	1.94
Longlines	92.16	62.33	95.34
Other	0.02	0.03	0.02
Other nets	0.00	0.03	0.02
Other trawl	0.00	0.00	0.00
Otter trawl	0.00	4.16	0.83
Pots & traps	0.00	0.00	0.00
Purse seine	0.00	0.06	0.00
Unknown	0.00	2.93	0.38

Table 8. Percentage of dusky shark commercial landings by region for all gear combined.

	Region		
Year	**Gulf of Mexico**	**Mid Atlantic**	**South Atlantic**
1987	0.00	0.00	0.00
1988	0.00	100.00	0.00
1989	0.00	97.65	2.35
1990	0.00	100.00	0.00
1991	3.23	94.95	1.81
1992	1.71	83.01	15.28
1993	1.93	67.00	31.07
1994	7.69	42.80	49.51
1995	21.44	26.30	52.26
1996	39.35	7.97	52.69
1997	28.35	18.36	53.30
1998	23.54	4.96	71.51
1999	14.80	70.40	14.80
2000	1.14	85.00	13.86
2001	0.00	83.35	16.65

Table 9. Percentage of hammerhead shark complex commercial landings by gear for all years combined. (Years listed under each region indicate those used in the summary calculation.)

	Region		
Gear	**Gulf of Mexico** (1990 - 2001)	**Mid Atlantic** (1990 - 2001)	**South Atlantic** (1988 - 2001)
Diving	0.00	0.00	0.00
Gillnets	0.20	57.16	28.09
Lines	11.52	7.94	1.46
Longlines	84.90	34.79	70.24
Other	0.38	0.00	0.19
Other nets	0.00	0.00	0.00
Other trawl	0.00	0.00	0.00
Otter trawl	0.00	0.11	0.01
Pots & traps	0.00	0.00	0.00
Purse seine	0.00	0.00	0.00
Unknown	2.99	0.00	0.00

Table 10. Percentage of the hammerhead shark complex commercial landings by region for all gear combined.

	Region		
Year	**Gulf of Mexico**	**Mid Atlantic**	**South Atlantic**
1987	0.00	0.00	0.00
1988	42.72	52.02	5.26
1989	0.00	0.00	100.00
1990	60.82	27.80	11.38
1991	37.17	38.14	24.69
1992	0.94	39.18	59.87
1993	2.83	24.78	72.38
1994	9.00	2.13	88.87
1995	24.83	0.68	74.48
1996	37.41	2.10	60.49
1997	15.63	1.57	82.81
1998	29.14	2.74	68.12
1999	25.40	0.46	74.14
2000	58.23	0.20	41.57
2001	50.45	0.35	49.20

Table 11. Percentage of unclassified shark fin commercial landings by gear for all years combined. (Years listed under each region indicate those used in the summary calculation.)

	Region		
Gear	**Gulf of Mexico** (1990 - 2001)	**Mid Atlantic** (1988 - 2001)	**South Atlantic** (1991 - 2001)
Diving	0.05	0.00	0.00
Gillnets	6.82	53.95	25.46
Lines	6.04	0.19	2.48
Longlines	70.12	41.94	71.58
Other	11.18	0.01	0.09
Other nets	0.05	0.01	0.02
Other trawl	0.03	0.00	0.00
Otter trawl	0.08	3.40	0.30
Pots & traps	0.01	0.00	0.00
Purse seine	0.00	0.00	0.00
Unknown	5.63	0.50	0.07

Table 12. Percentage of the unclassified shark fin commercial landings by region for all gear combined.

	Region		
Year	**Gulf of Mexico**	**Mid Atlantic**	**South Atlantic**
1987	0.00	0.00	0.00
1988	0.00	100.00	0.00
1989	0.00	12.60	87.40
1990	95.96	4.04	0.00
1991	68.93	3.55	27.53
1992	58.38	8.36	33.27
1993	43.46	15.84	40.70
1994	47.29	13.86	38.85
1995	66.12	6.30	27.58
1996	53.02	7.68	39.30
1997	47.25	8.07	44.68
1998	48.21	7.58	44.21
1999	47.82	4.36	47.82
2000	49.38	5.79	44.83
2001	43.90	22.76	33.34

Table 13. *Recreational harvest estimates of U.S. Atlantic sharks for 1999, 2000, and 2001. Data for 1999 are from MRFSS, the Headboat Survey, and the Texas Parks & Wildlife Survey (TXPWD); data for 2000 are from MRFSS and TXPWD as estimates from the Headboat Survey were not yet available; data for 2001 are from MRFSS only as estimates from the two other surveys were not yet available. All catches are in numbers.*

Large Coastal Sharks	Catch	**Small Coastal Sharks**	Catch	**Pelagic Sharks**	Catch
1999:		**1999:**		**1999:**	
Shark, blacktip	34,962	Shark, Atlantic sharpnose	68,621	Shark, blue	5,218
Shark, bull	3,107	Shark, blacknose	6,019	Shark, shortfin mako	1,383
Shark, dusky	5,570	Shark, bonnethead	41,128	Shark, thresher	4,512
Shark, great hammerhead	352	Shark, finetooth	78		
Shark, hammerhead genus	75	Shark, smalltail	4		
Shark, lemon	146				
Shark, night	50			Total:	11,113
Shark, nurse	1,503				
Shark, reef	3				
Shark, requiem family	3,975				
Shark, requiem genus	8,978				
Shark, sandbar	20,553				
Shark, scalloped hammerhead	1,349				
Shark, silky	3,863				
Shark, smooth hammerhead	1			**Unknown Sharks**	
Shark, spinner	6,391				
Shark, tiger	153			Shark, unc.	6,935
Total:	91,031	Total:	115,850	Total:	6,935
2000:		**2000:**		**2000:**	
Shark, blacktip	74,055	Shark, Atlantic sharpnose	114,973	Shark, blue	7,010
Shark, bull	6,045	Shark, blacknose	10,463	Shark, shortfin mako	5,808
Shark, dusky	2,397	Shark, bonnethead	57,405	Shark, thresher	528
Shark, great hammerhead	921	Shark, finetooth	1,786		
Shark, hammerhead genus	3,693	Shark, smalltail	29	Total:	13,346
Shark, lemon	2,801				
Shark, nurse	2,138				
Shark, reef	182				
Shark, requiem family	6,349				
Shark, requiem genus	11,600				
Shark, sandbar	10,743				
Shark, scalloped hammerhead	3,517				
Shark, silky	5,109			**Unknown Sharks**	
Shark, spinner	6,355				
Shark, tiger	1,479			Shark, unc.	11,177
Total:	137,384	Total:	184,656	Total:	11,177
2001:		**2001:**		**2001:**	
Shark, blacktip	48,848	Shark, Atlantic sharpnose	109,114	Shark, blue	950
Shark, bull	3,751	Shark, blacknose	15,059	Shark, shortfin mako	2,882
Shark, dusky	5,703	Shark, bonnethead	58,600		
Shark, great hammerhead	3,367	Shark, finetooth	6,729		
Shark, lemon	5,946			Total:	3,832
Shark, nurse	4,280				
Shark, reef	182				
Shark, requiem family	11,397				
Shark, requiem genus	4,887				
Shark, sandbar	35,880				
Shark, sand tiger	604				

Shark, scalloped hammerhead	1,108				
Shark, silky	4,070				
Shark, smooth hammerhead	703				
Shark, spinner	2,896			**Unknown Sharks**	
Shark, tiger	784				
				Shark, unc.	24,091
Total:	134,406	Total:	189,502	Total:	24,091

Table 14. *Estimates of the annual catches of blacktip sharks based on area-gear definitions described in SB-IV-31 and species breakouts in SB-IV-12, Cortés (1999, 2000), and Table 2 of this report.*

Year	Blacktip lb landed	Average Wt	lb landed/ Ave Wt	Recreational Harvest	Rec+Com	Unreported	Mexico small fish	Menhaden Fishery bycatch	Total
1986	1,213,040	20.5	59,173	162,402	221,575	18,675	15,642	?	255,892
1987	1,463,544	20.5	71,392	129,551	200,943	52,725	22,346	?	276,014
1988	3,300,321	20.5	160,991	139,806	300,797	56,650	29,050	?	386,497
1989	3,832,421	20.5	186,947	111,368	298,315	48,150	35,754	?	382,219
1990	2,052,287	20.5	100,112	94,136	194,248	26,050	42,458	?	262,756
1991	2,744,292	20.5	133,868	150,794	284,662	5,650	49,161	?	339,473
1992	3,610,218	20.5	176,108	157,663	333,771		55,865	?	389,636
1993	3,086,965	20.5	150,584	109,057	259,641		62,569	?	322,210
1994	3,829,364	19.3	198,413	66,106	264,519		62,569	12,200	339,288
1995	2,915,797	20.5	142,234	59,892	202,126		62,569	11,200	275,895
1996	2,121,714	21.8	97,326	79,753	177,079		62,569	11,700	251,348
1997	2,170,597	23.6	91,974	70,963	162,937		62,569	11,700	237,206
1998	2,626,806	25.5	103,012	82,310	185,322		62,569	11,700	259,591
1999	1,650,319	29.4	56,133	34,962	91,095		62,569	11,700	165,364
2000	1,684,420	32.8	51,354	74,055	125,409		62,569	11,700	199,678
2001	1,445,770	33.5	43,157	48,848	92,005		62,569	11,700	166,274

Table 15. *Estimates of the annual catches of sandbar sharks based on area-gear definitions described in SB-IV-31 and species breakouts in SB-IV-12, Cortés (1999, 2000), and Table 2 of this report.*

Year	Sandbar lb landed	Average Wt	lb landed/ Ave wt	Recreational Harvest	Rec+Com	Unreported	Menhaden Fishery bycatch	Total
1986	796,509	35.9	22,187	123,660	145,847	6,225	?	152,072
1987	2,285,644	35.9	63,667	32,551	96,218	17,575	?	113,793
1988	2,737,938	35.9	76,266	64,792	141,058	56,650	?	197,708
1989	4,215,657	35.9	117,428	27,417	144,845	48,150	?	192,995
1990	4,026,470	35.9	112,158	58,814	170,972	26,050	?	197,022
1991	3,292,594	35.9	91,716	36,794	128,510	5,650	?	134,160
1992	3,470,449	35.9	96,670	36,294	132,964		?	132,964
1993	2,483,235	35.9	69,171	26,607	95,778		?	95,778
1994	4,691,470	37.1	126,455	14,974	141,429		486	141,915
1995	3,012,065	35.7	84,372	24,906	109,278		445	109,723
1996	2,004,759	30.6	65,515	35,711	101,226		465	101,691
1997	1,283,871	31.0	41,415	41,618	83,033		465	83,498
1998	1,494,078	23.8	62,776	35,766	98,542		465	99,007
1999	1,730,570	32.5	53,248	20,553	73,801		465	74,266
2000	1,538,020	41.2	37,331	10,743	48,074		465	48,539
2001	1,788,569	35.3	50,668	35,880	86,548		465	87,013

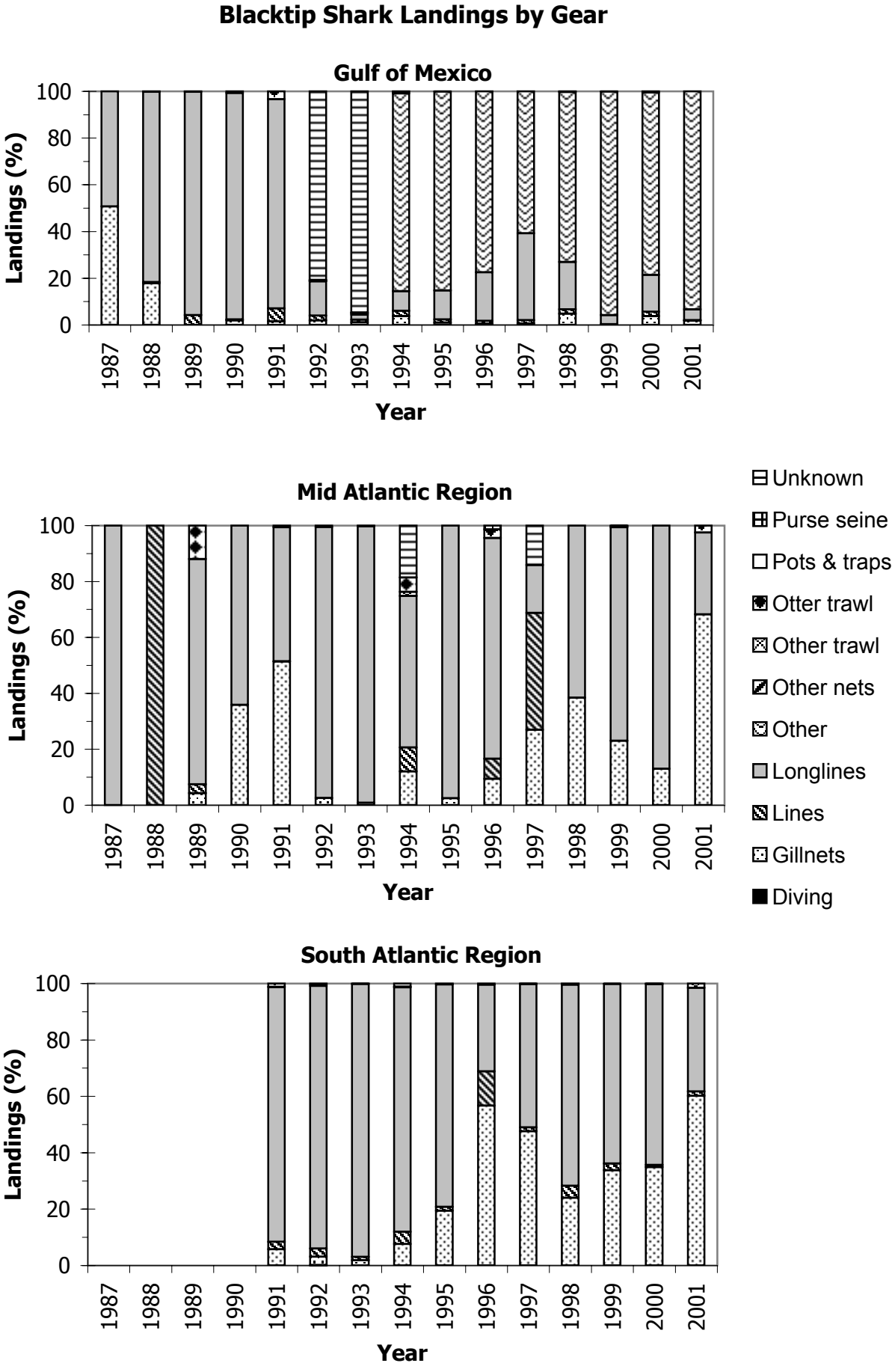


Figure 1. Commercial landings for the blacktip shark by region and gear type.

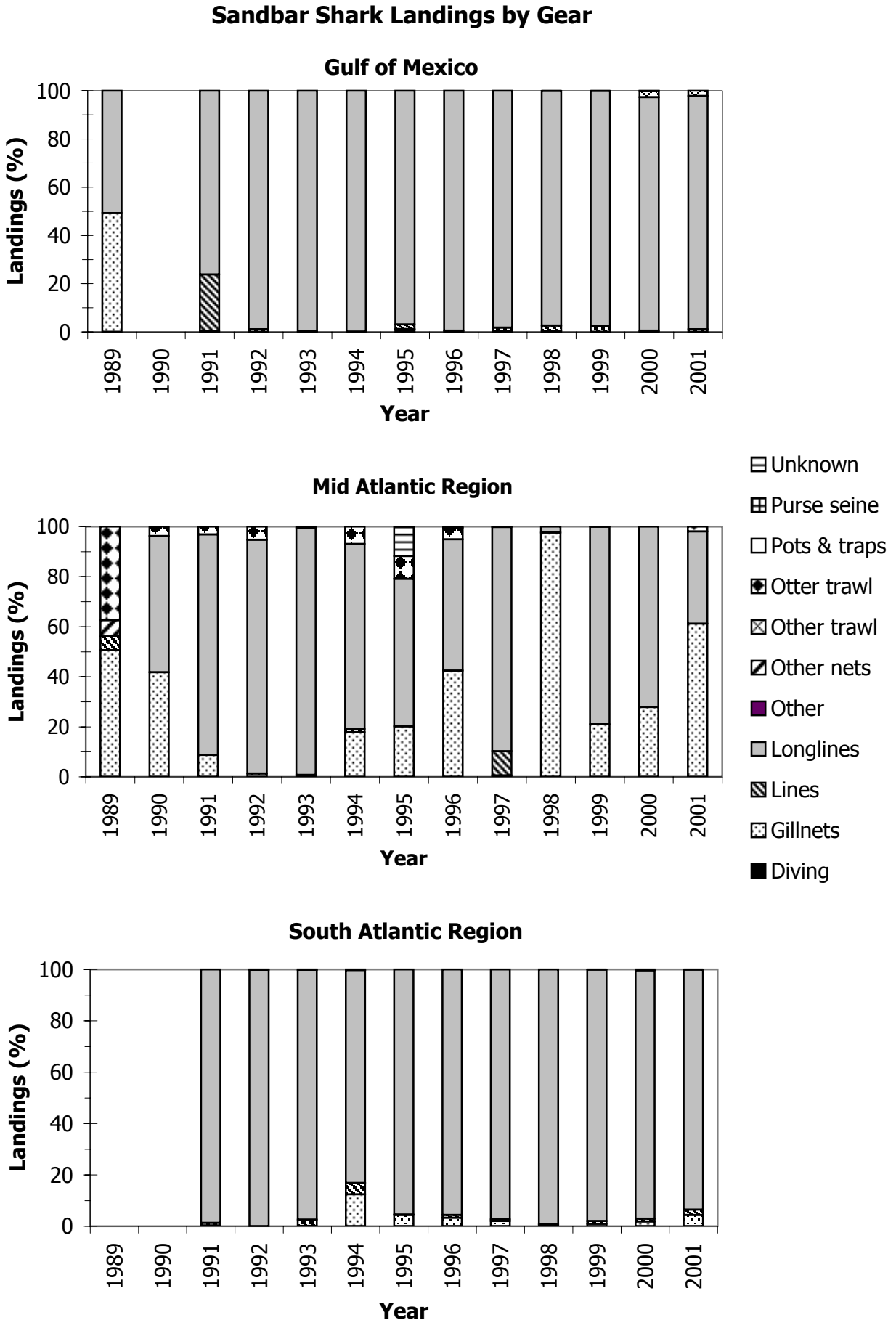


Figure 2. Commercial landings for the sandbar shark by region and gear type.

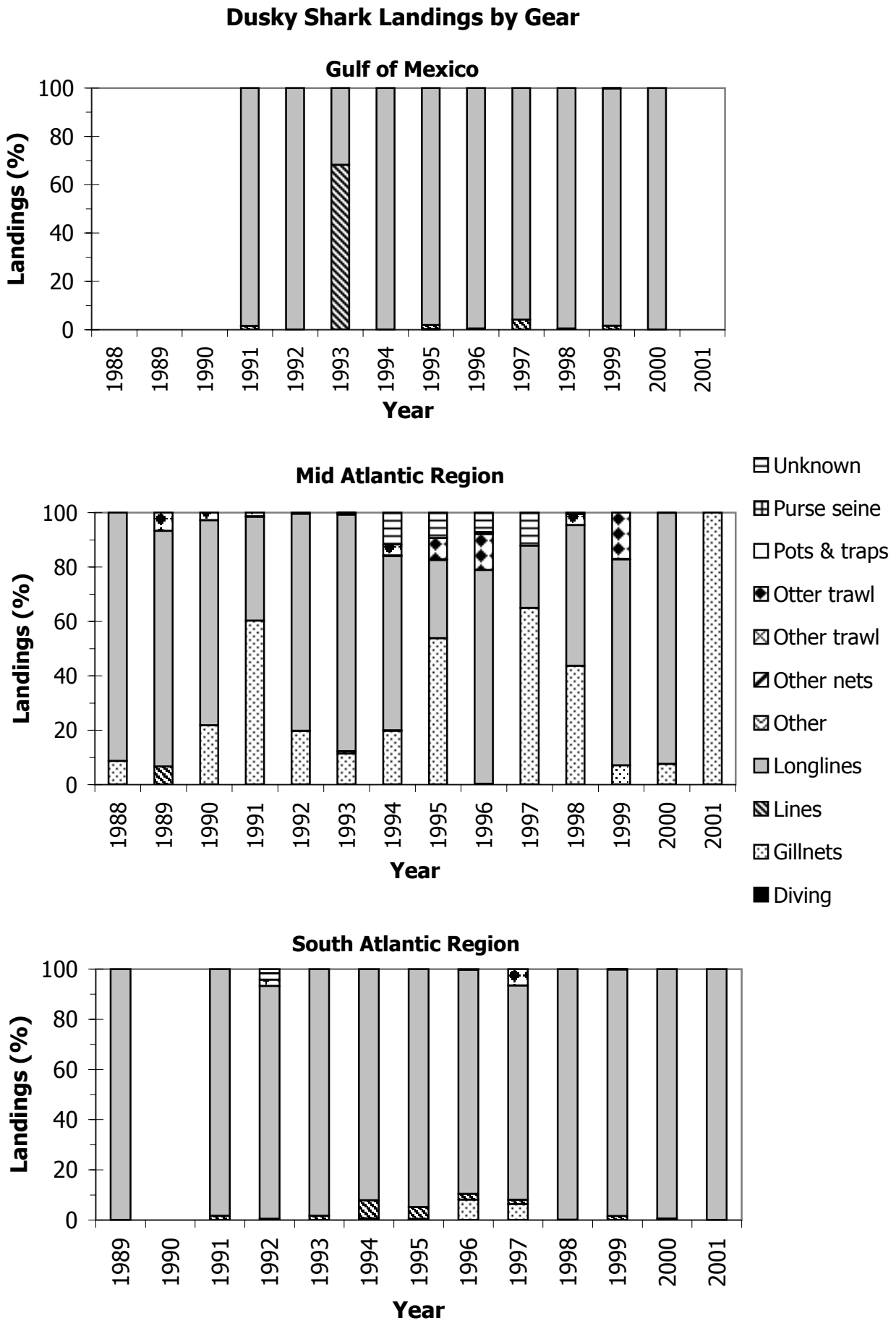


Figure 3. Commercial landings for the dusky shark by region and gear type.

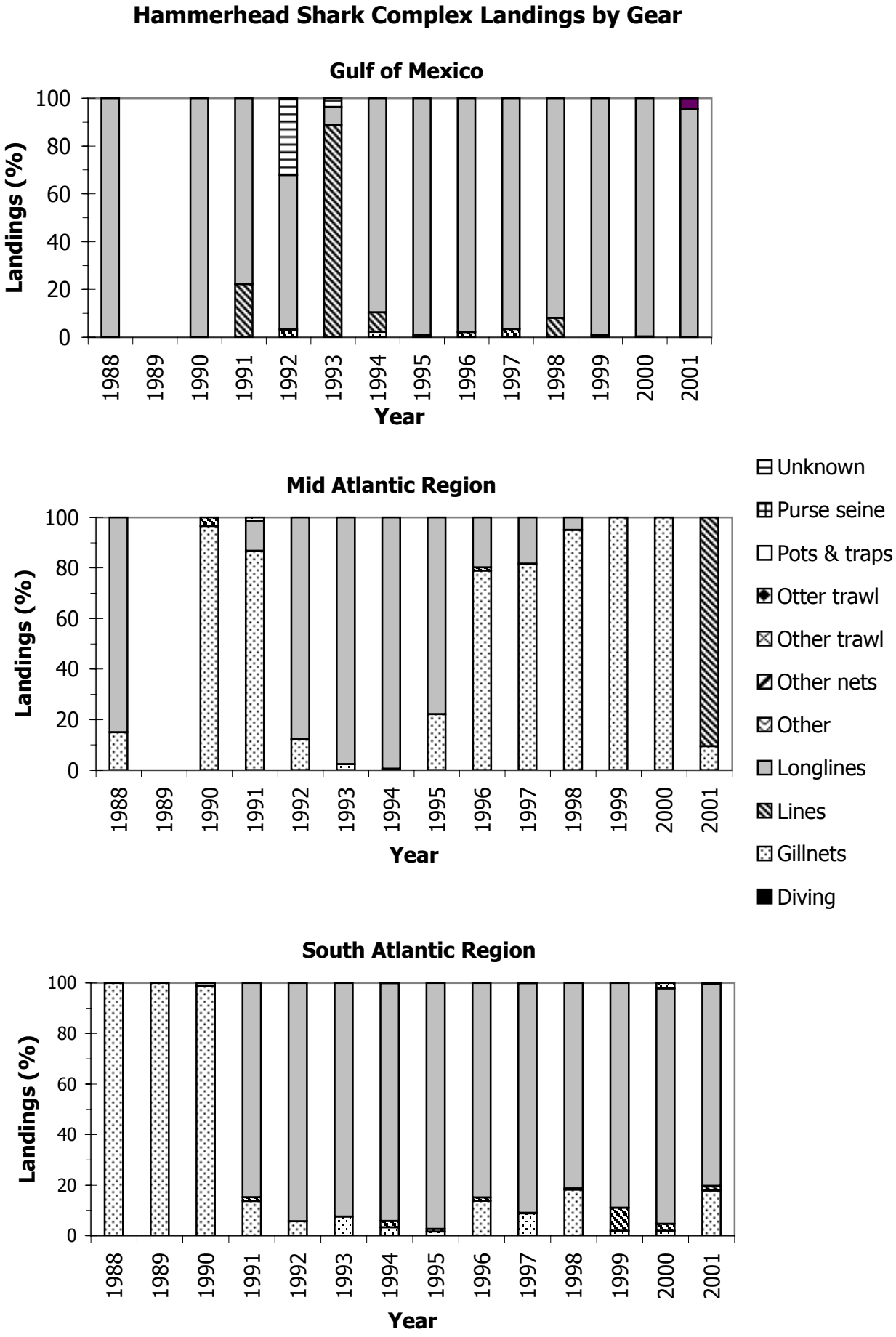


Figure 4. Commercial landings for the hammerhead shark complex by region and gear type.

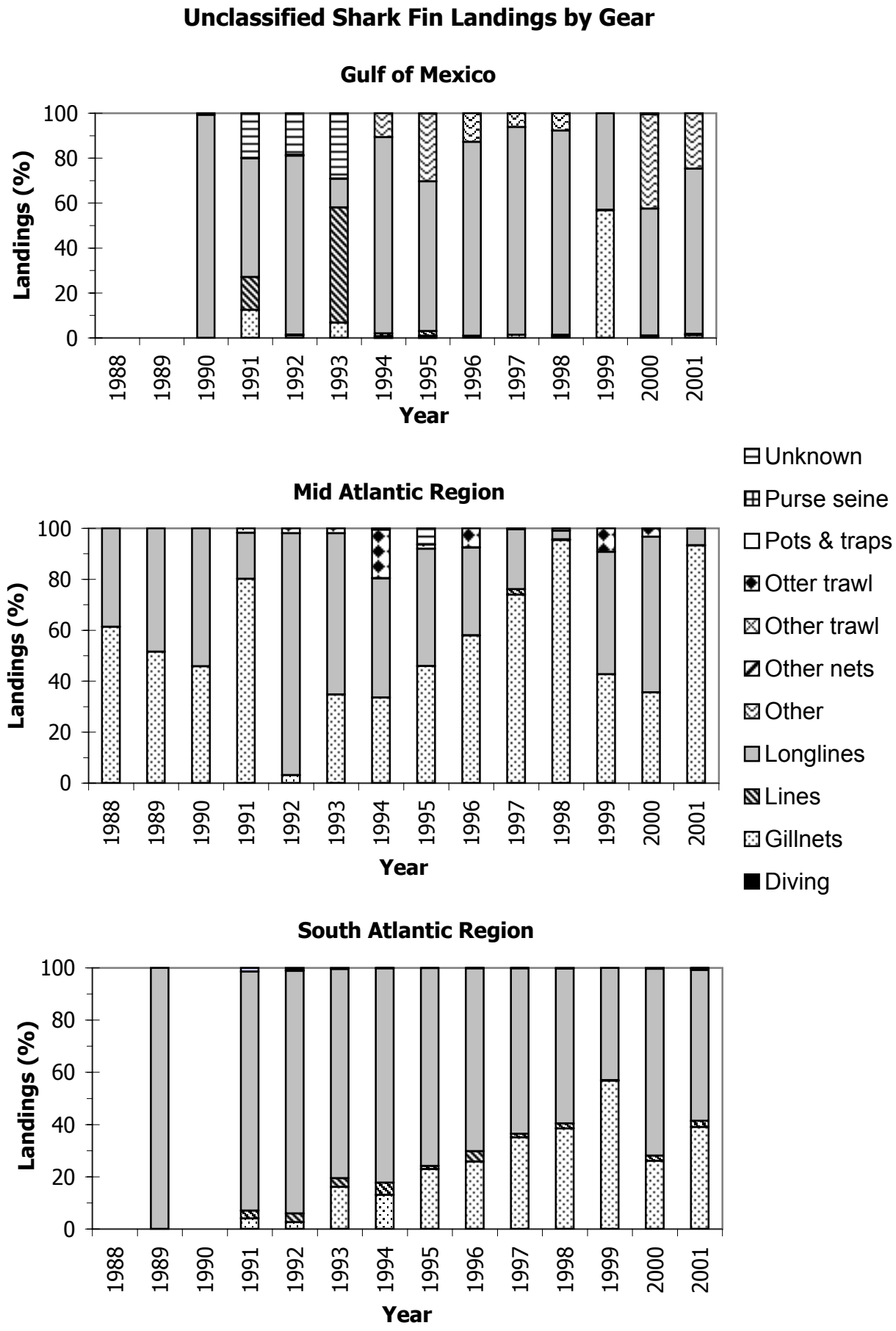


Figure 5. Commercial landings for the unclassified shark fin complex by region and gear type.

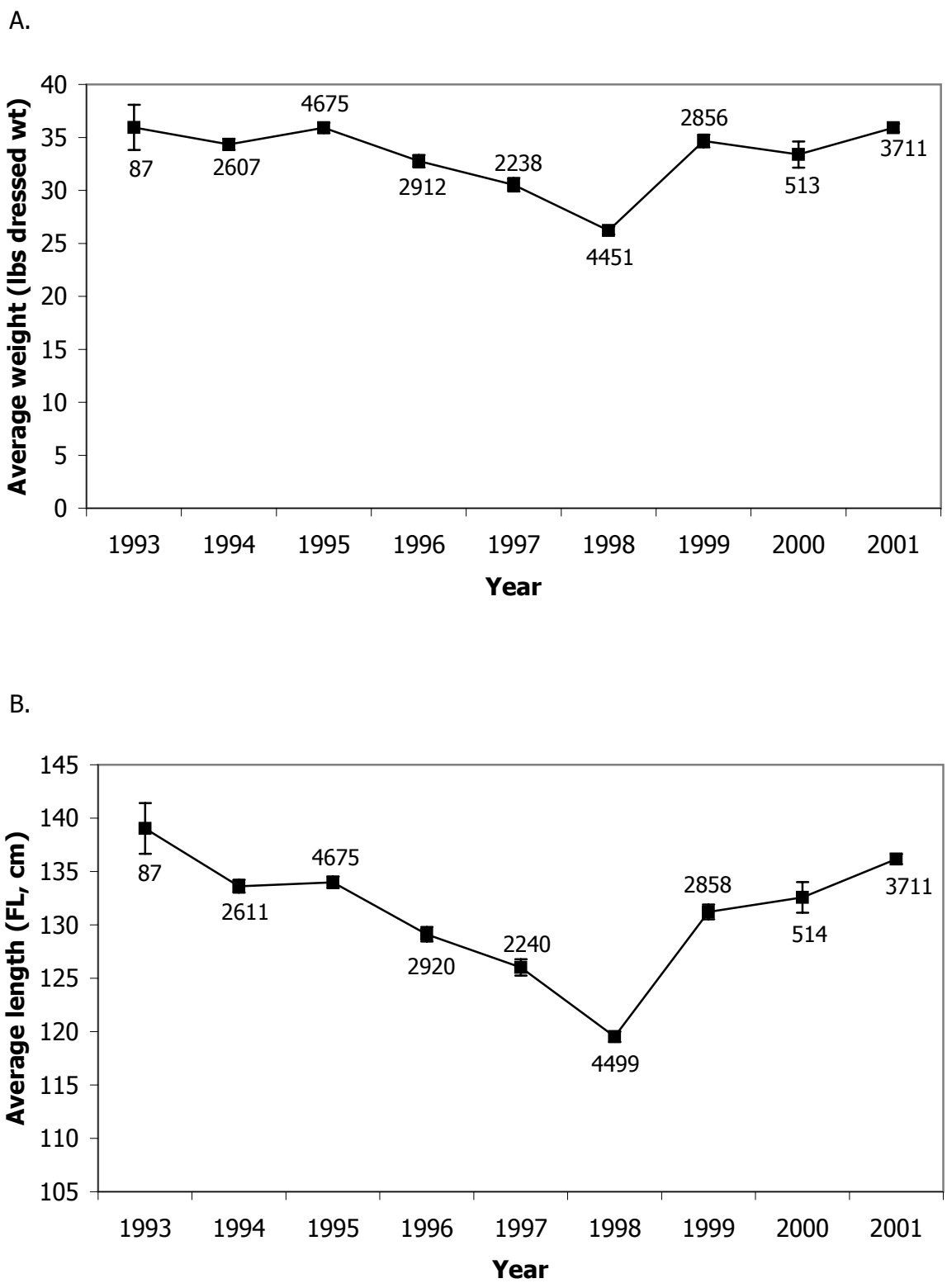


Figure 6. Average weight (A) and length (B) of large coastal sharks observed in the bottom longline observer program. Error bars represent +/- one standard error; sample sizes are indicated.

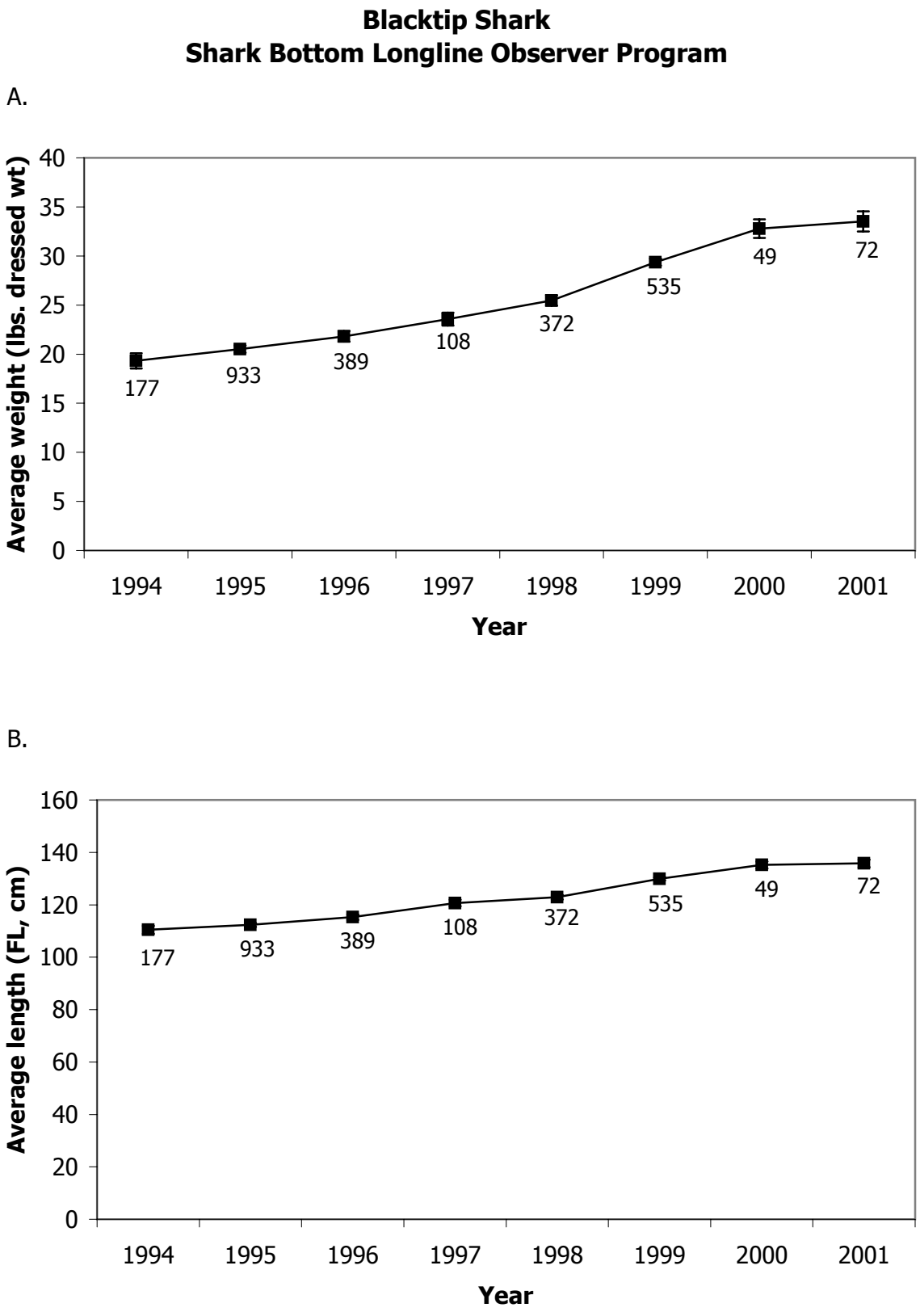
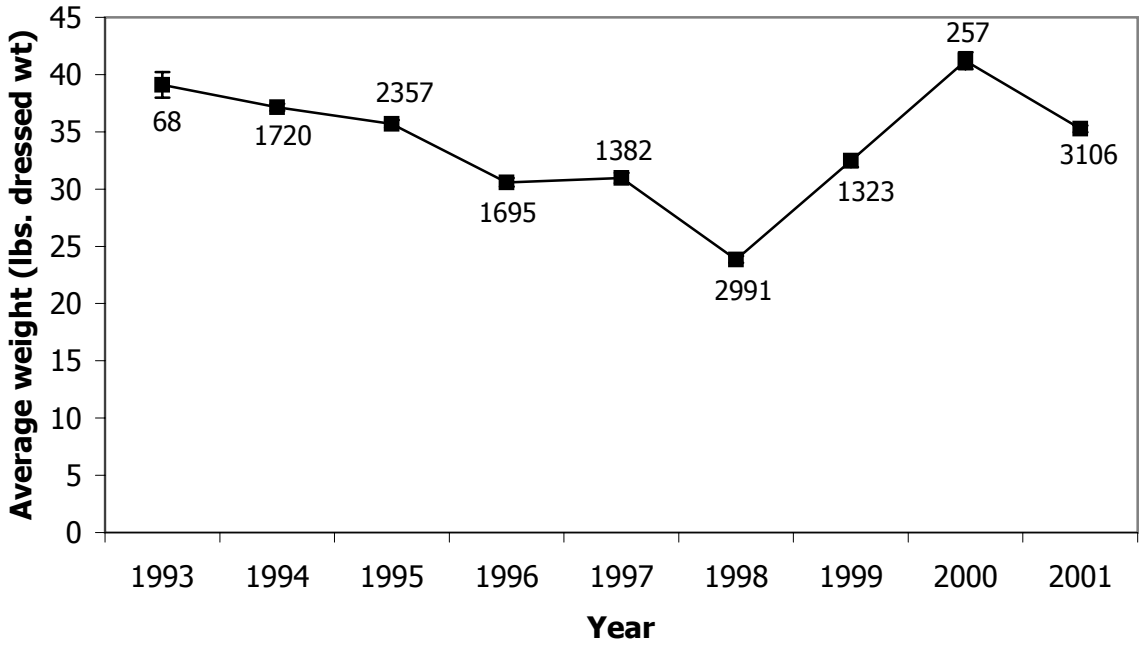


Figure 7. Average weight (A) and length (B) of blacktip sharks observed in the bottom longline observer program. Error bars represent +/- one standard error; sample sizes are indicated.

Sandbar Shark
Shark Bottom Longline Observer Program

A.



B.

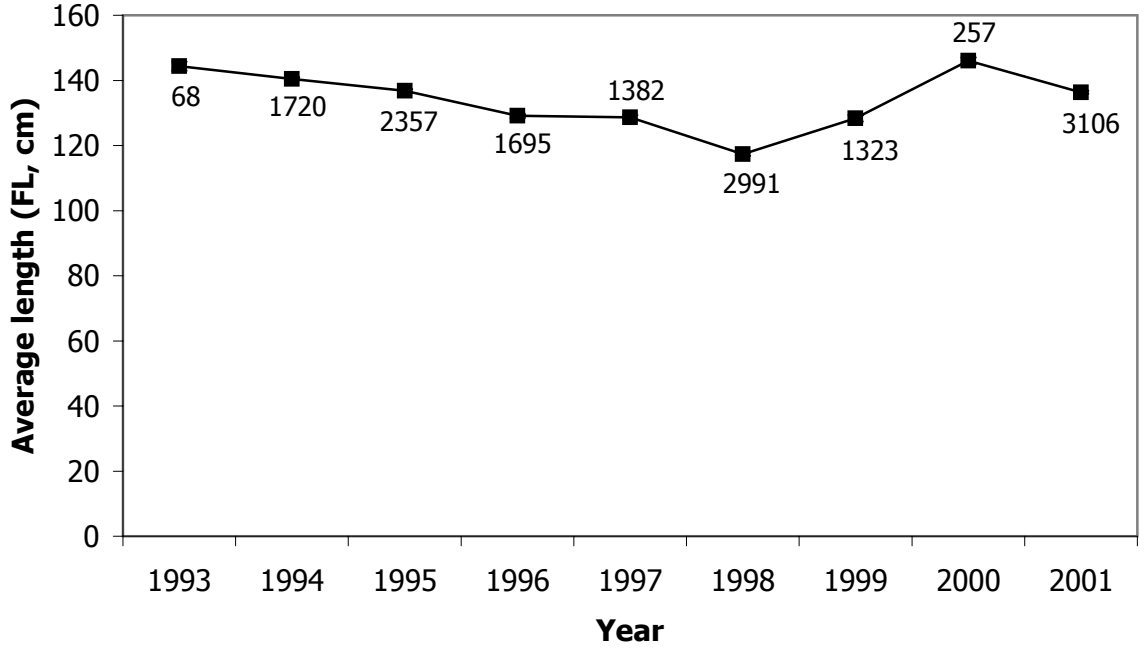


Figure 8. Average weight (A) and length (B) of sandbar sharks observed in the bottom longline observer program. Error bars represent +/- one standard error; sample sizes are indicated.

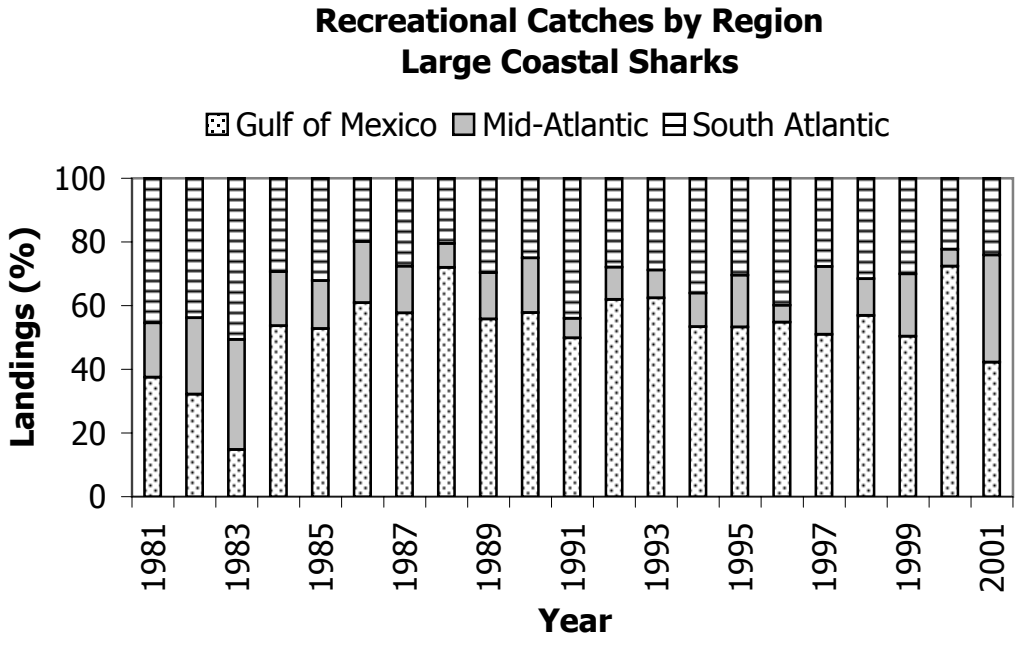
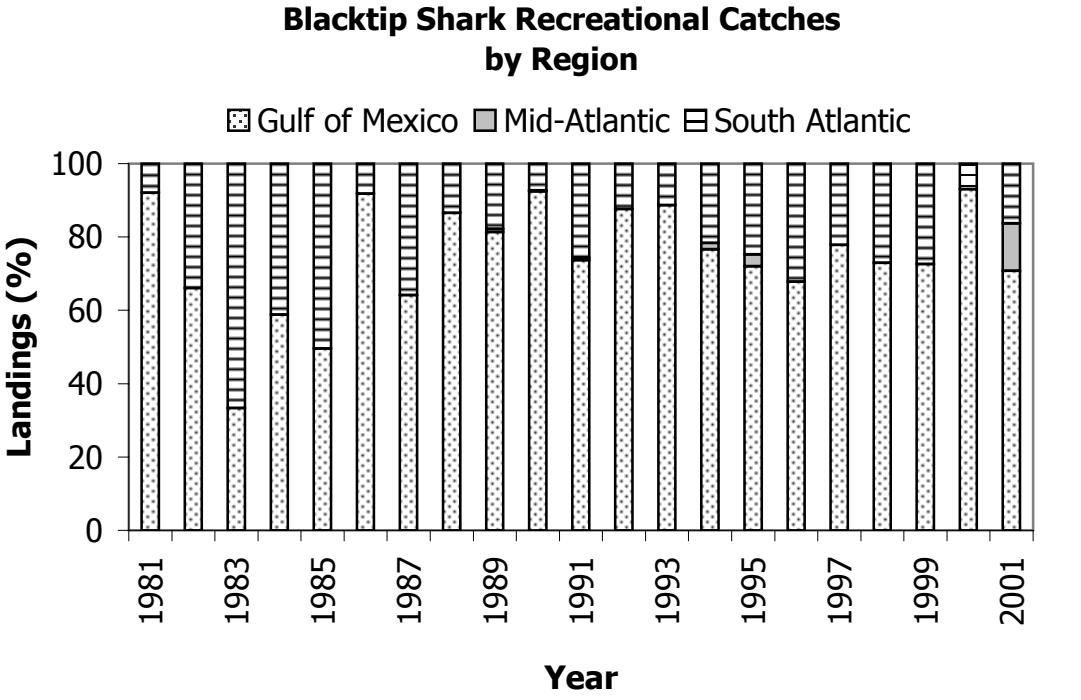


Figure 9. Recreational landings of the large coastal shark complex by region.



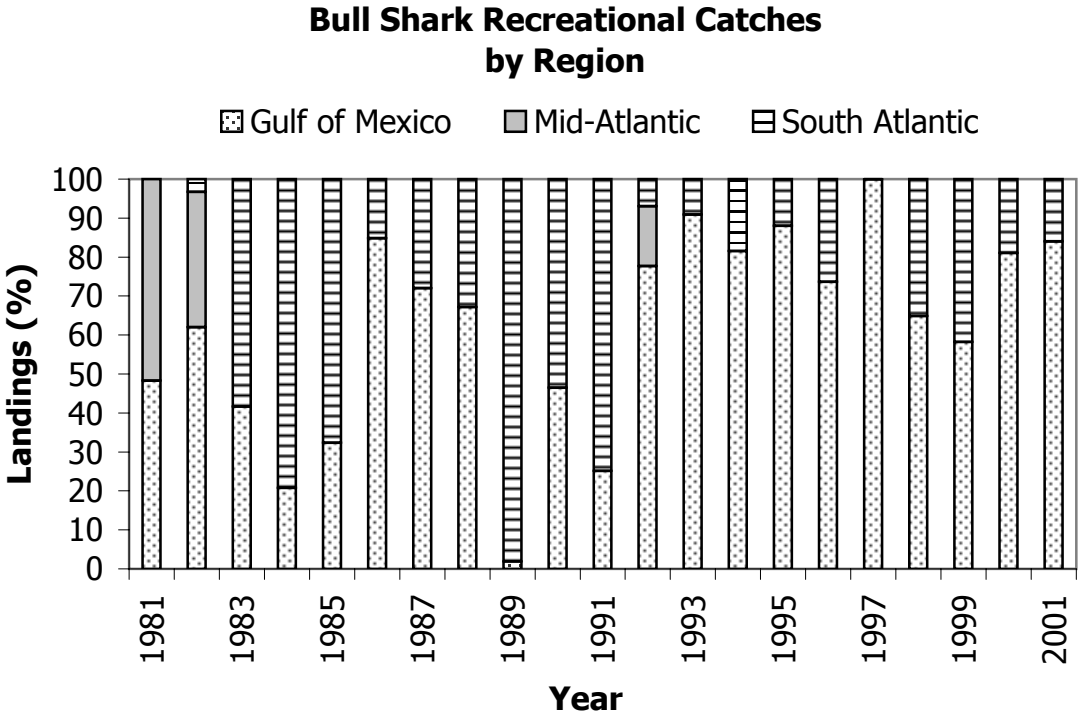
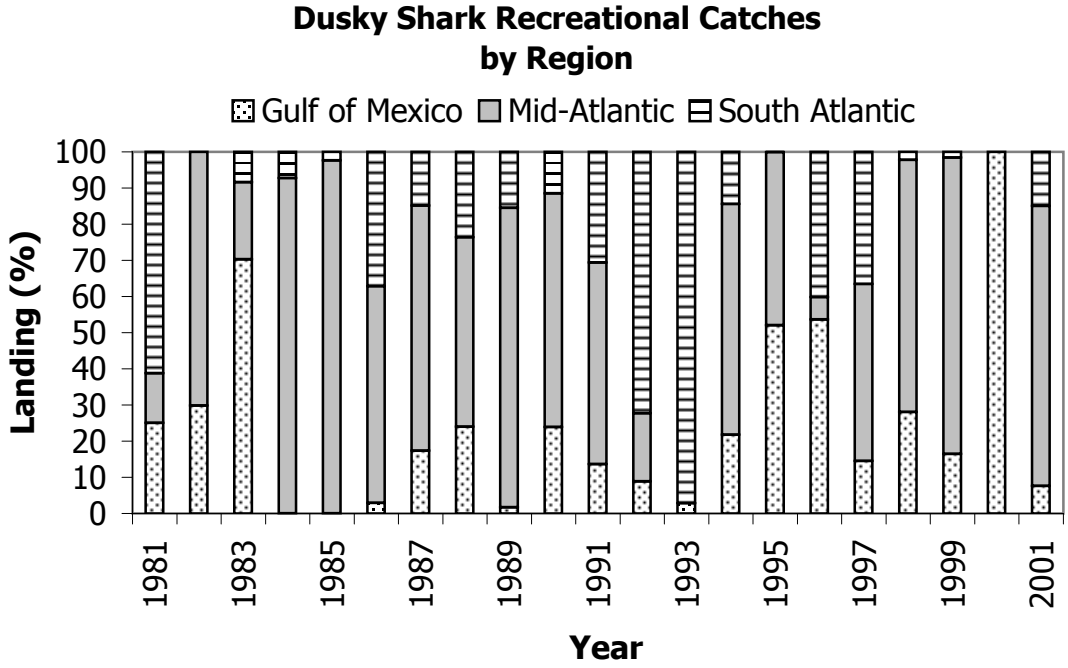


Figure 10. Recreational landings of selected large coastal shark species by region.



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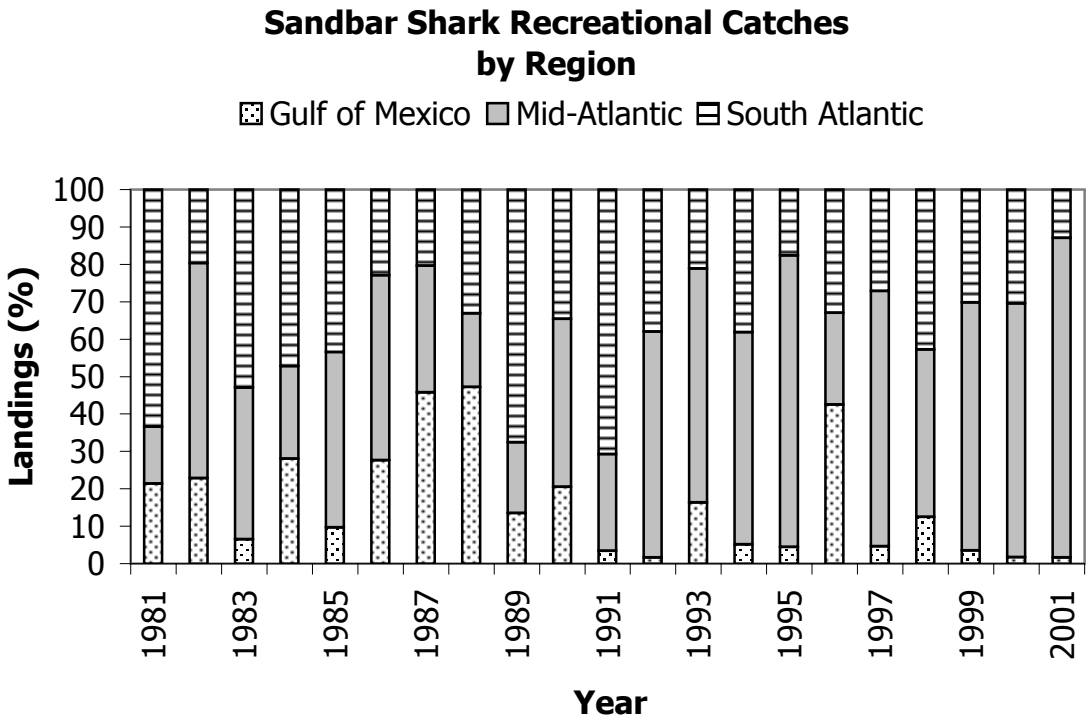

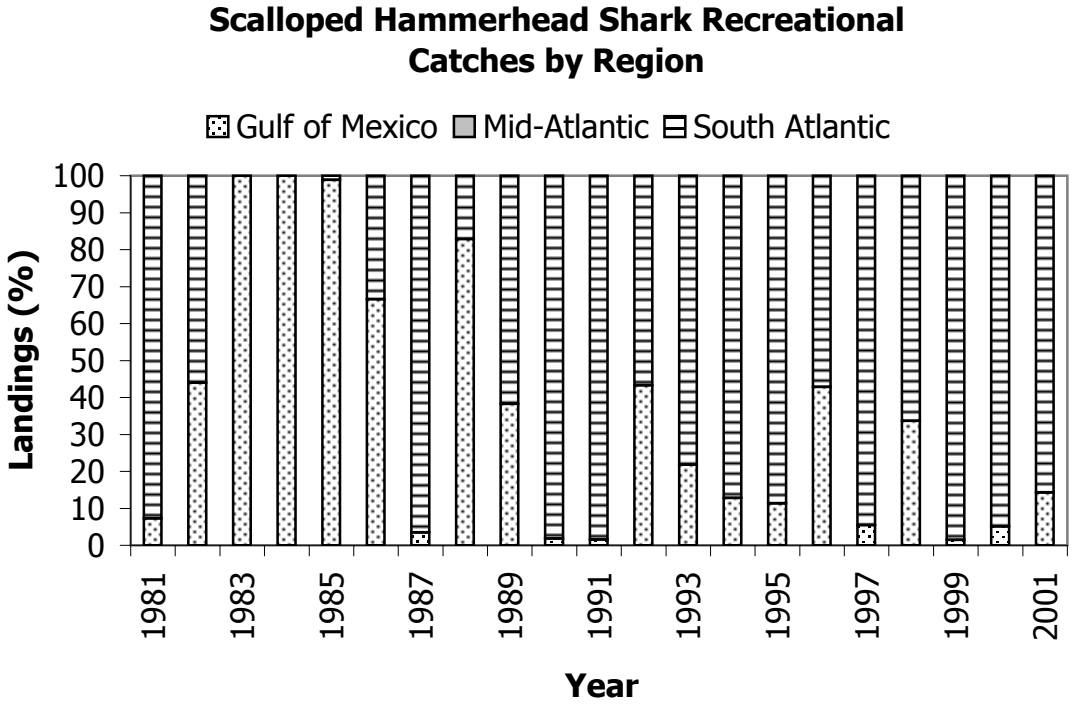

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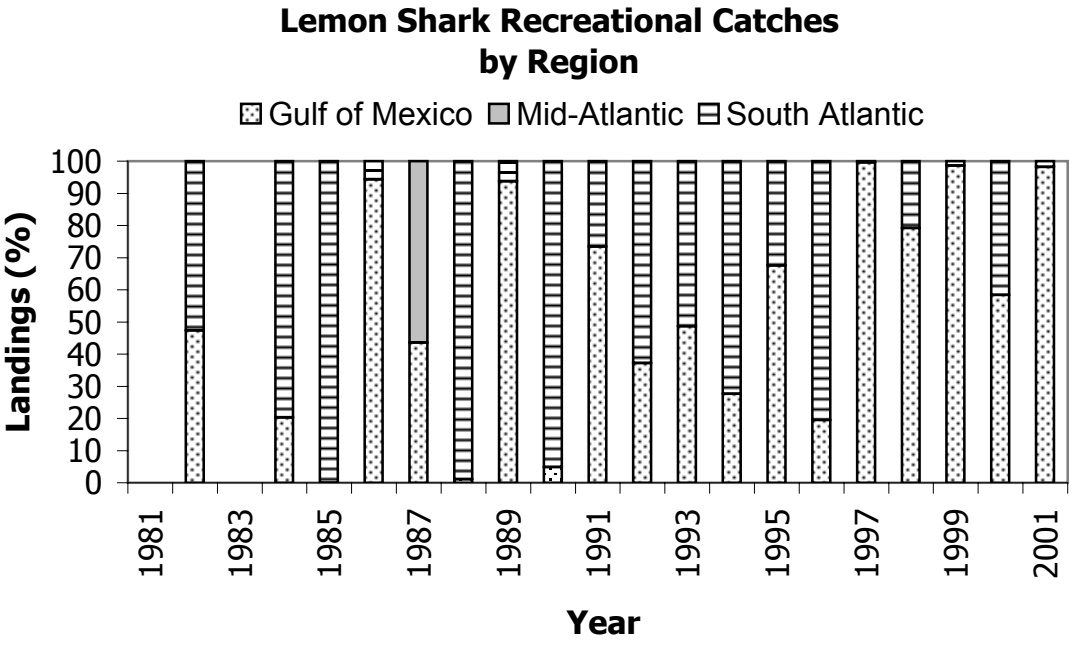


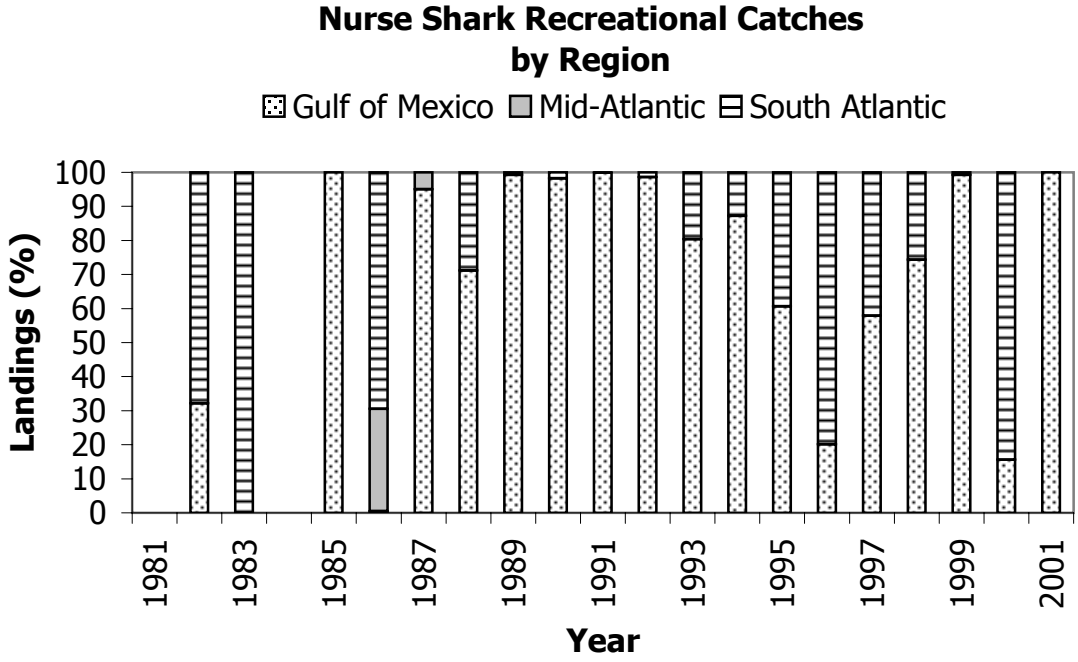
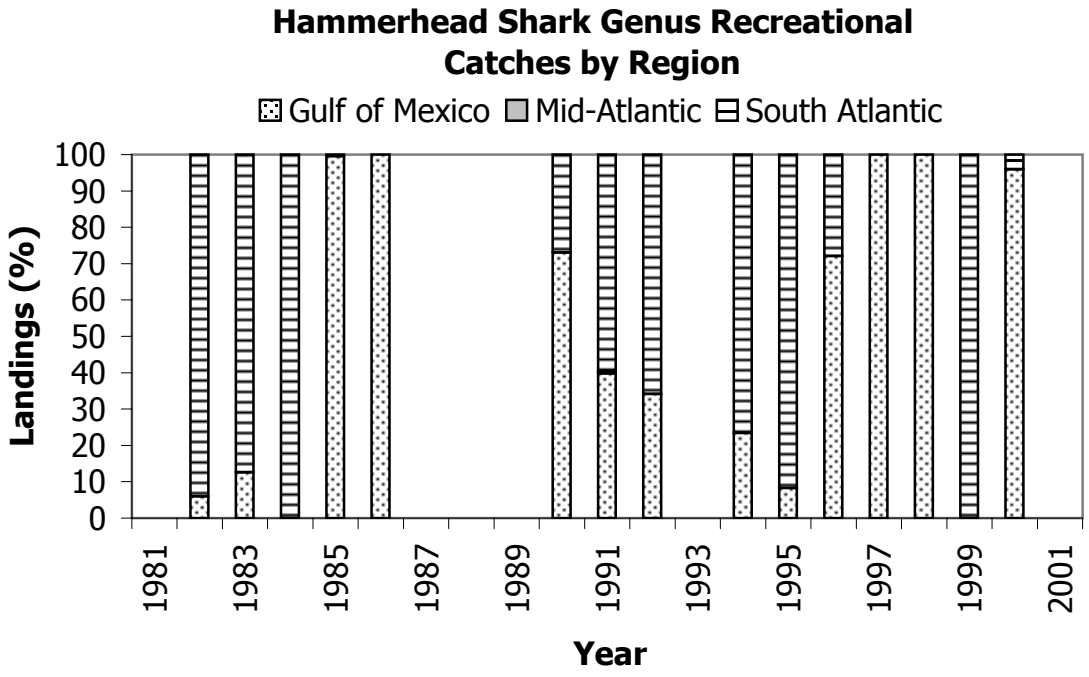


Figure 10 (cont.)



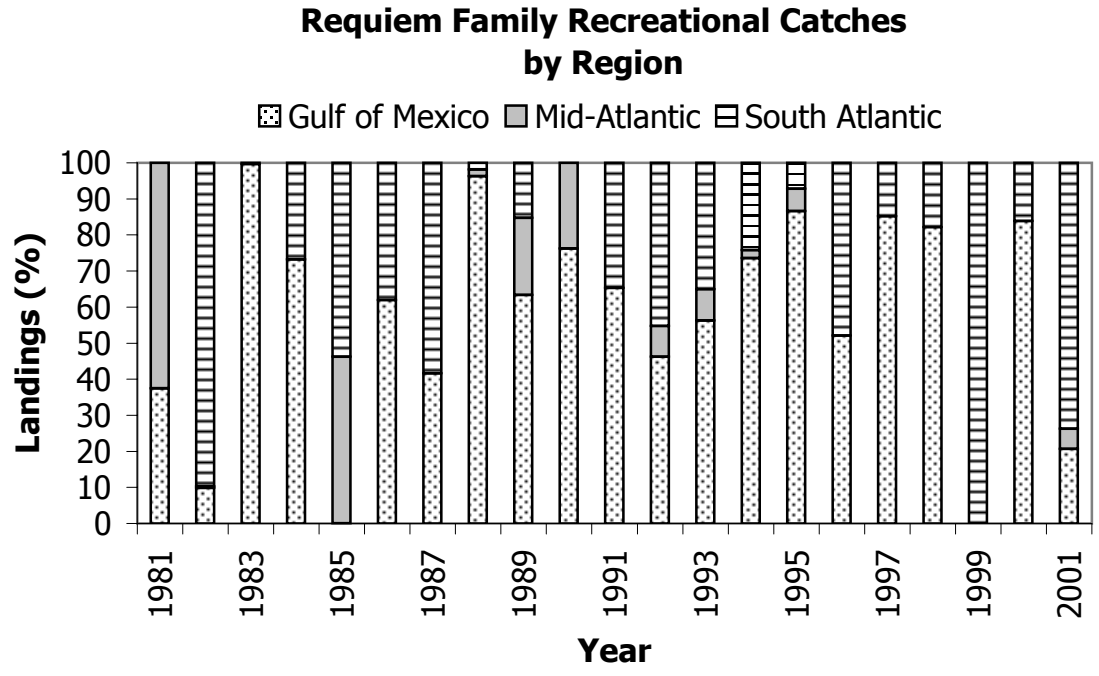
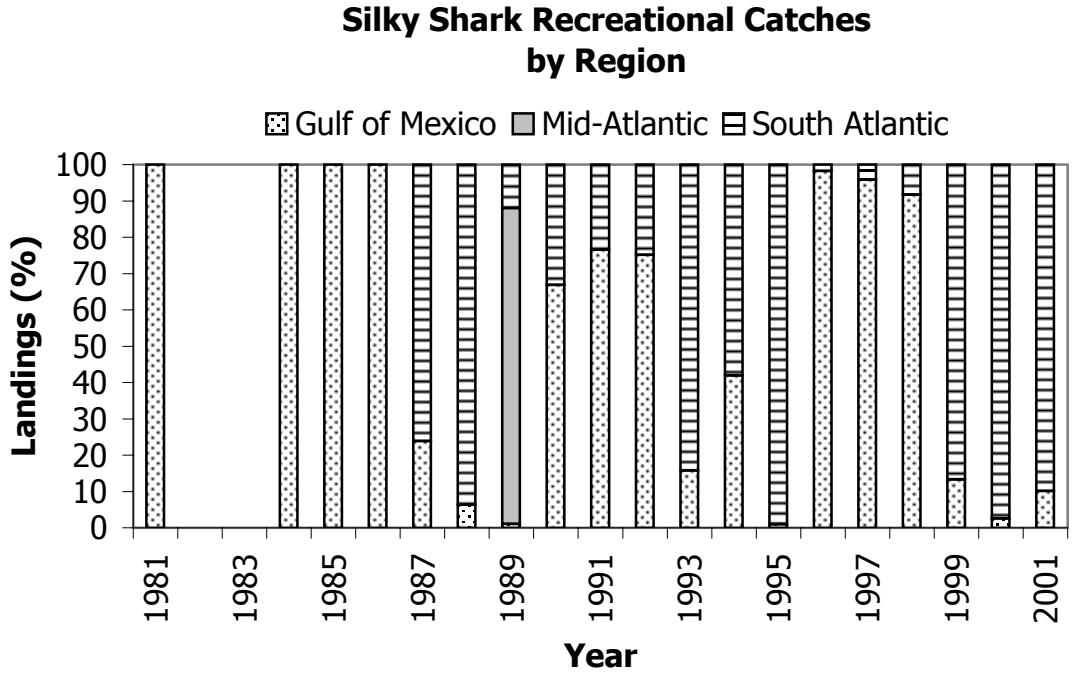


Figure 10 (cont.)



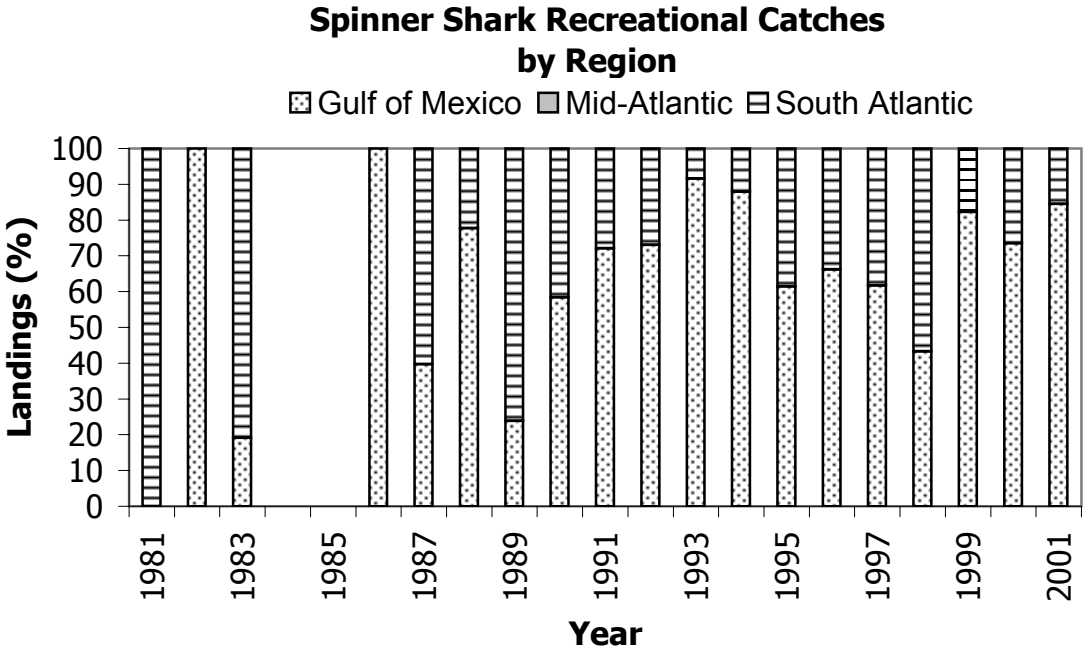
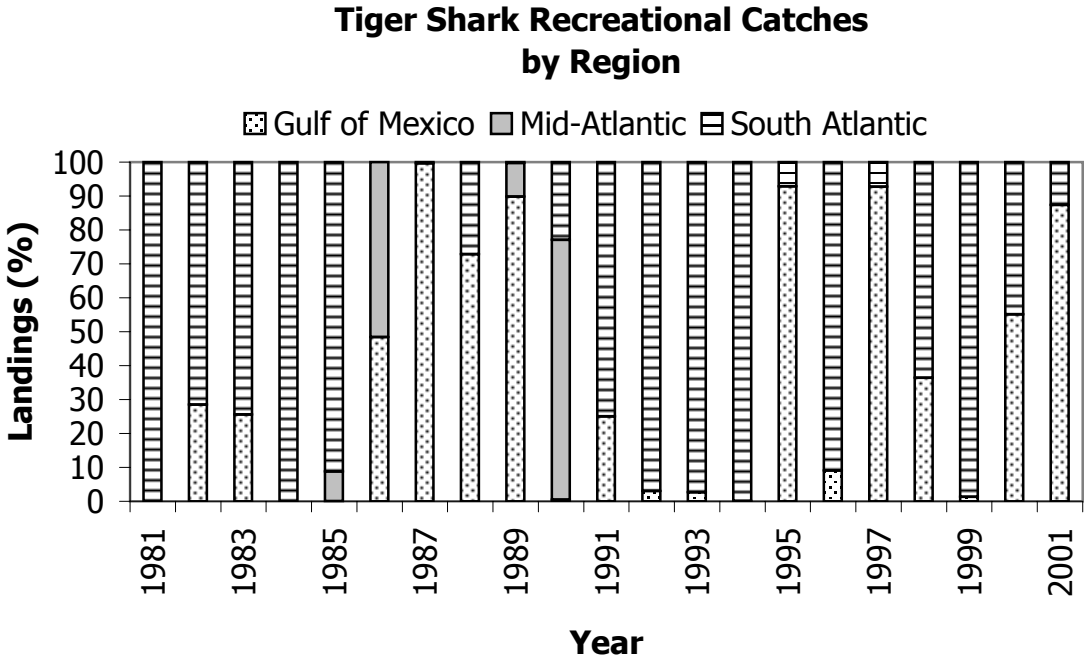


Figure 10 (cont.)



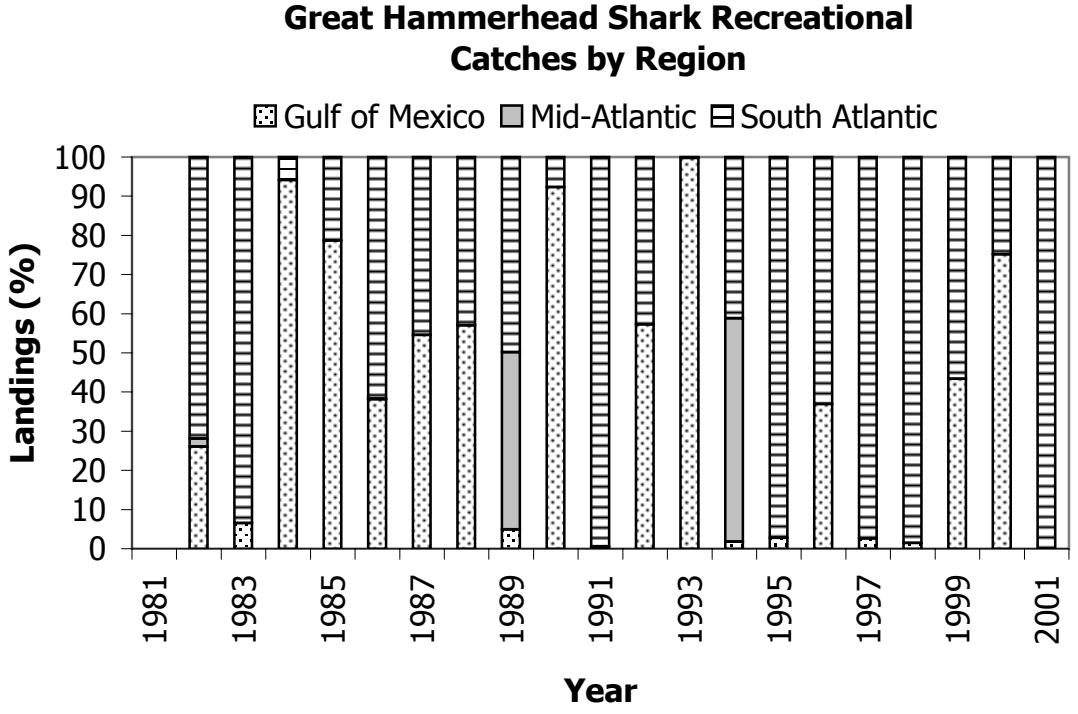


Figure 10 (cont.)

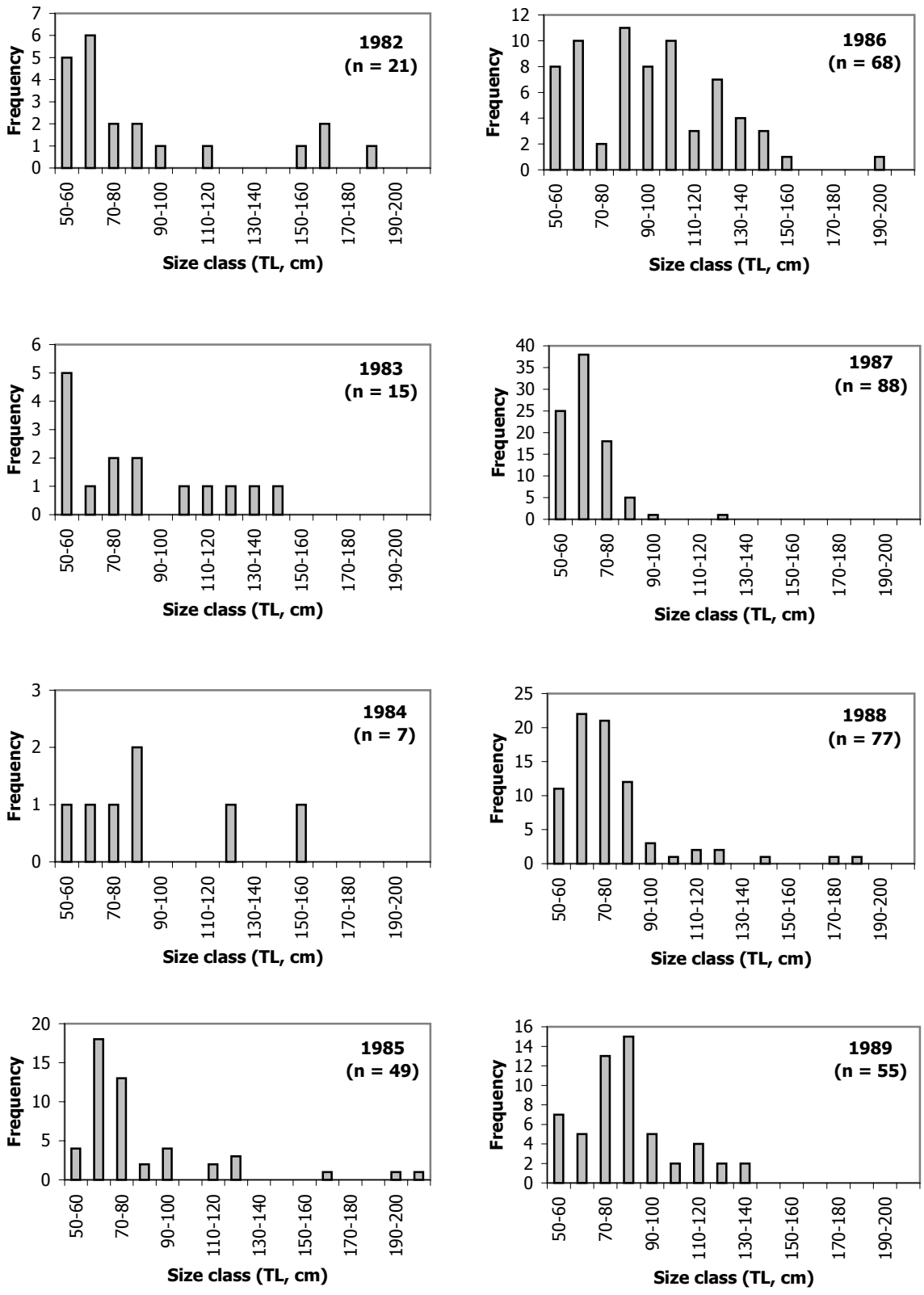


Figure 11: Length-frequency distributions for blacktip sharks observed in the MRFSS. Note the different scales along the y-axis.

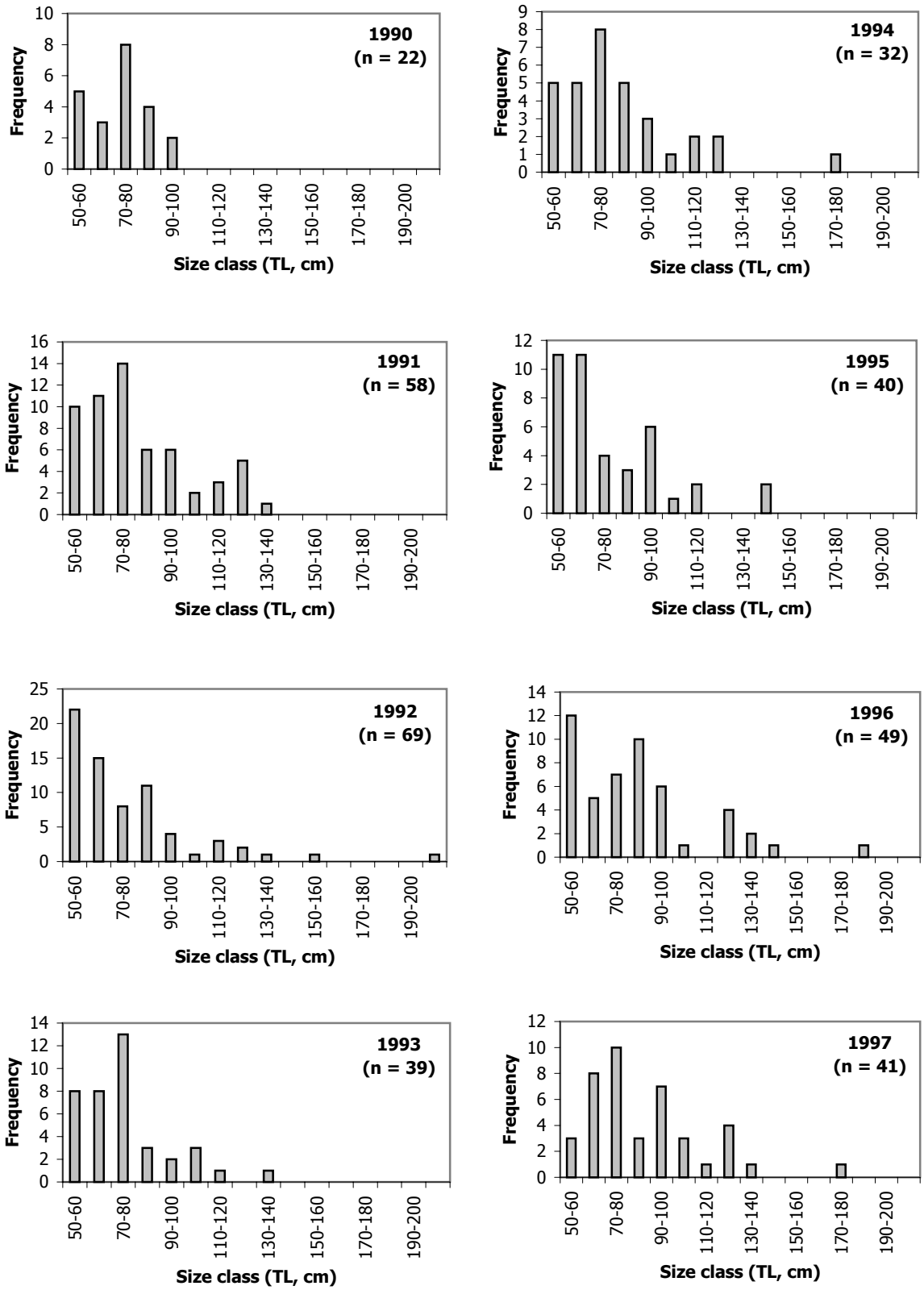


Figure 11 (cont.): Length-frequency distributions for blacktip sharks observed in the MRFSS. Note the different scales along the y-axis.

Blacktip Shark
Marine Recreational Fisheries Statistics Survey

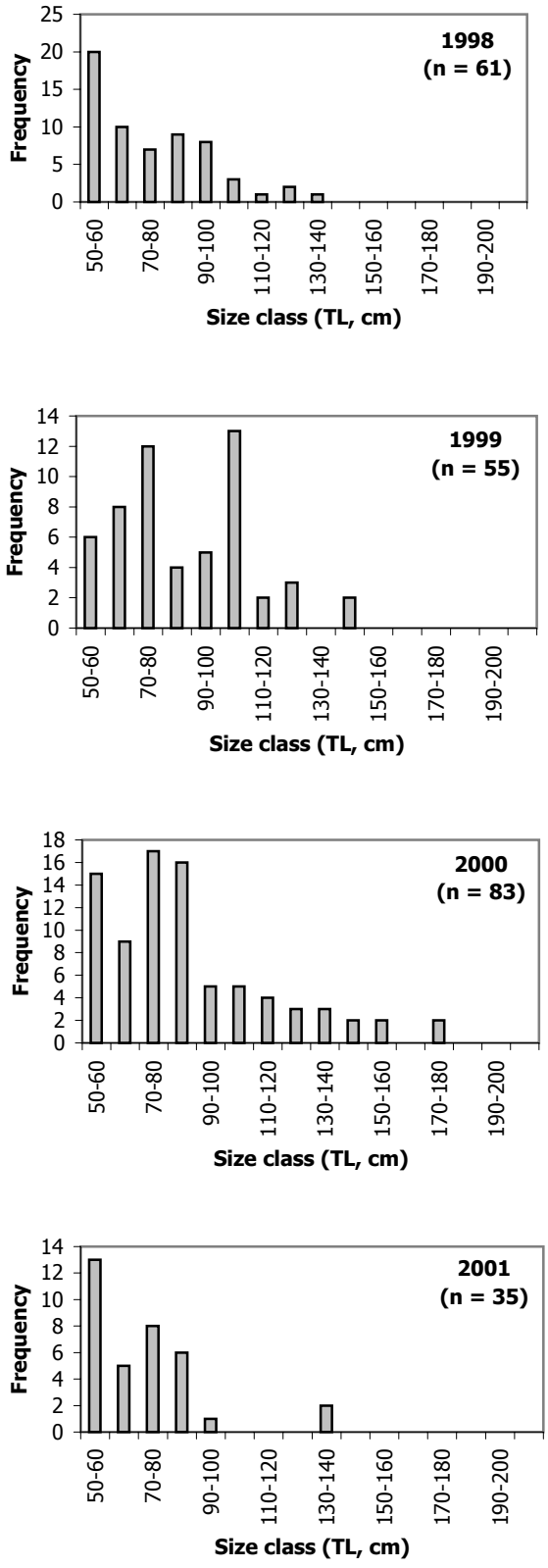


Figure 11 (cont.): Length-frequency distributions for blacktip sharks observed in the MRFSS. Note the different scales along the y-axis.

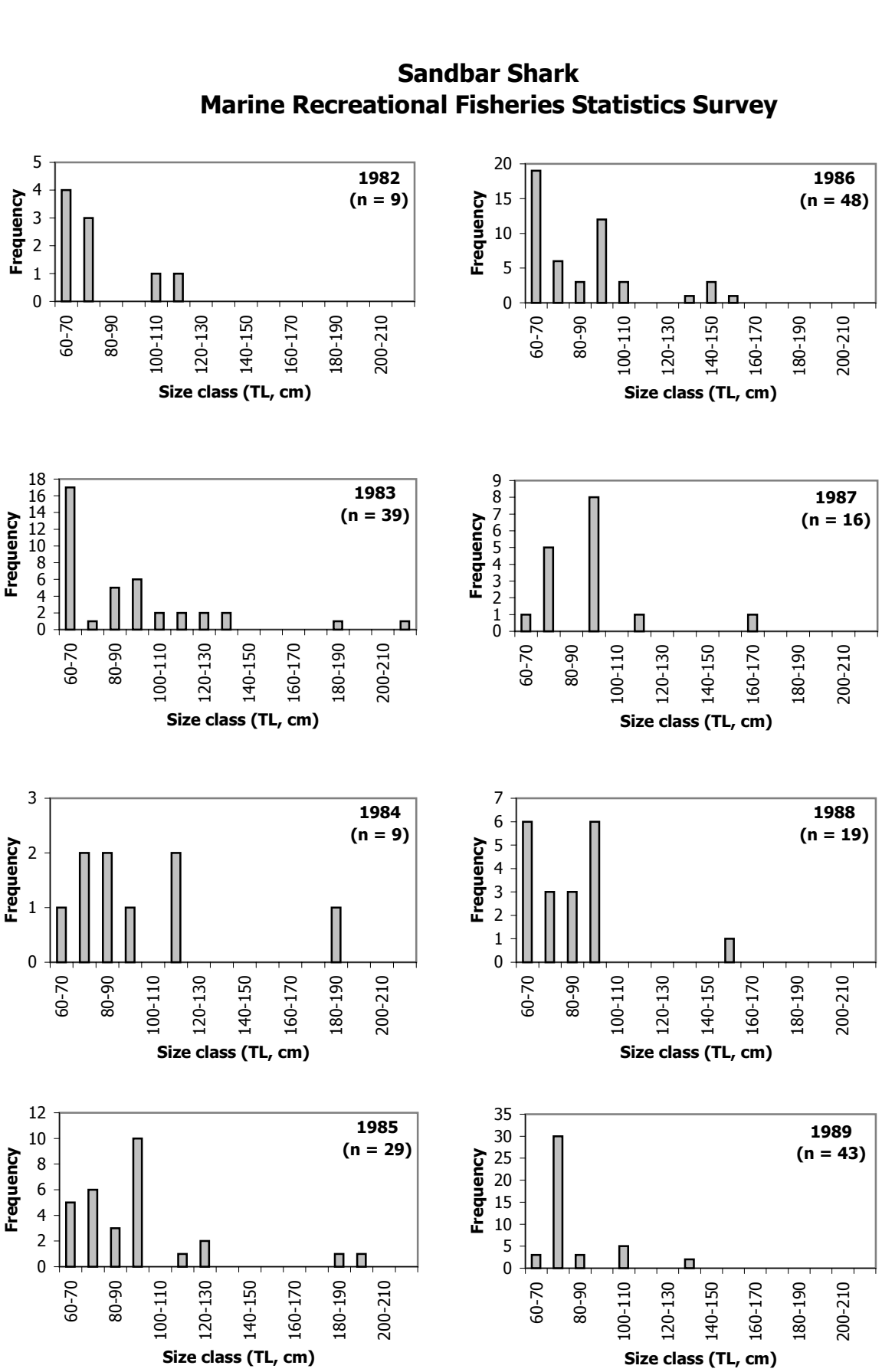


Figure 12: Length-frequency distributions for sandbar sharks observed in the MRFSS. Note the different scales along the y-axis.

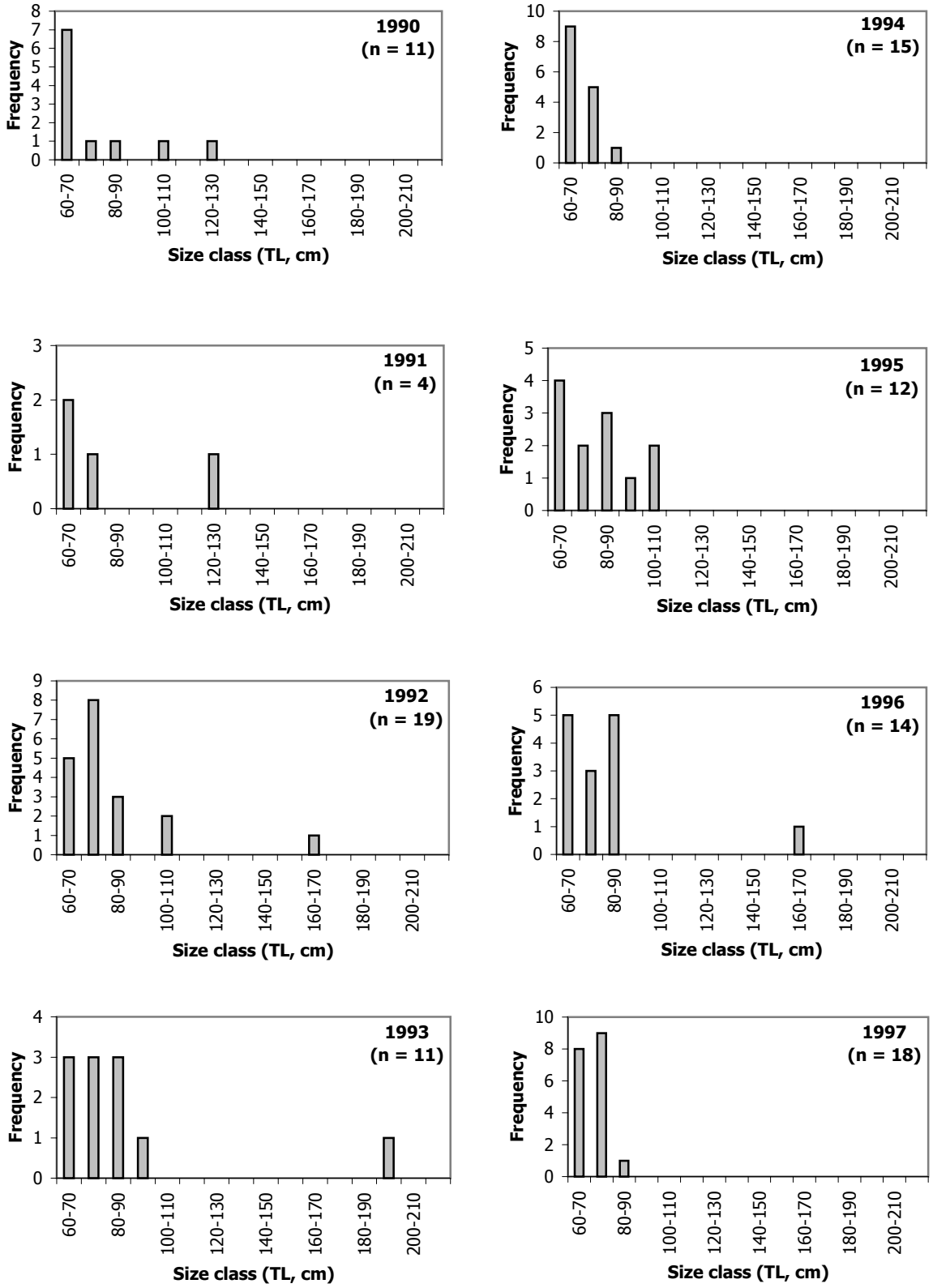


Figure 12 (cont.): Length-frequency distributions for sandbar sharks observed in the MRFSS. Note the different scales along the y-axis.

Sandbar Shark
Marine Recreational Fisheries Statistics Survey

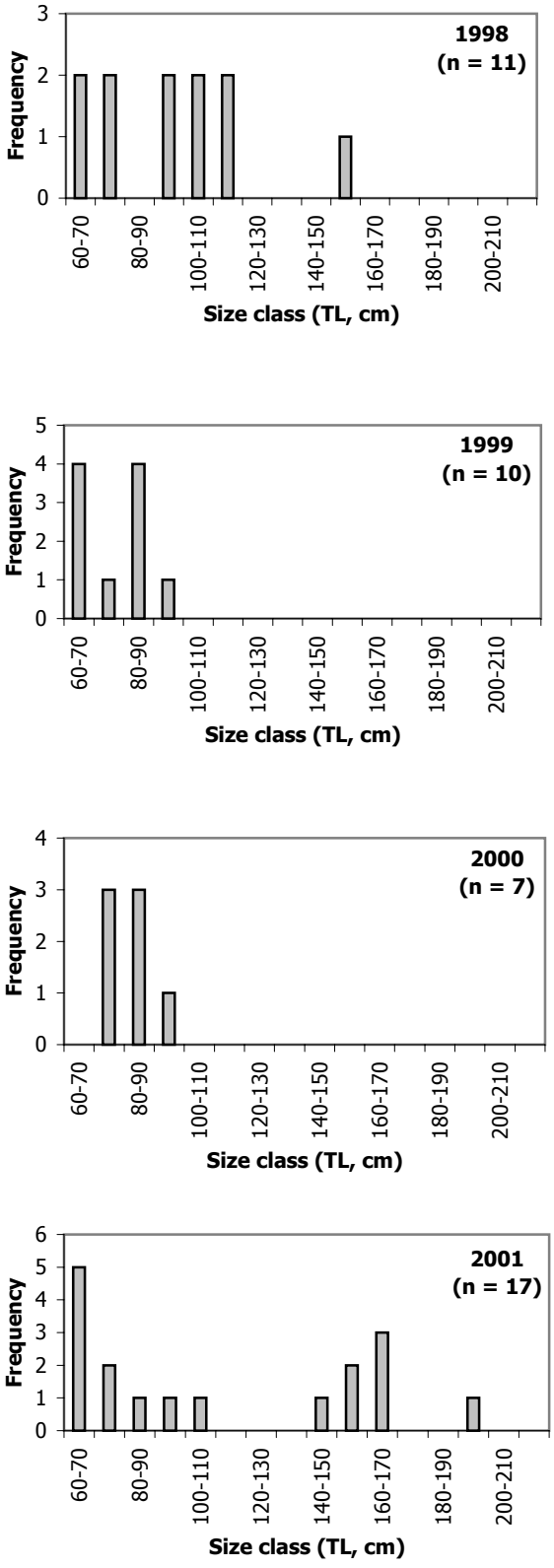


Figure 12 (cont.): Length-frequency distributions for sandbar sharks observed in the MRFSS. Note the different scales along the y-axis.

Dusky Shark
Marine Recreational Fisheries Statistics Survey

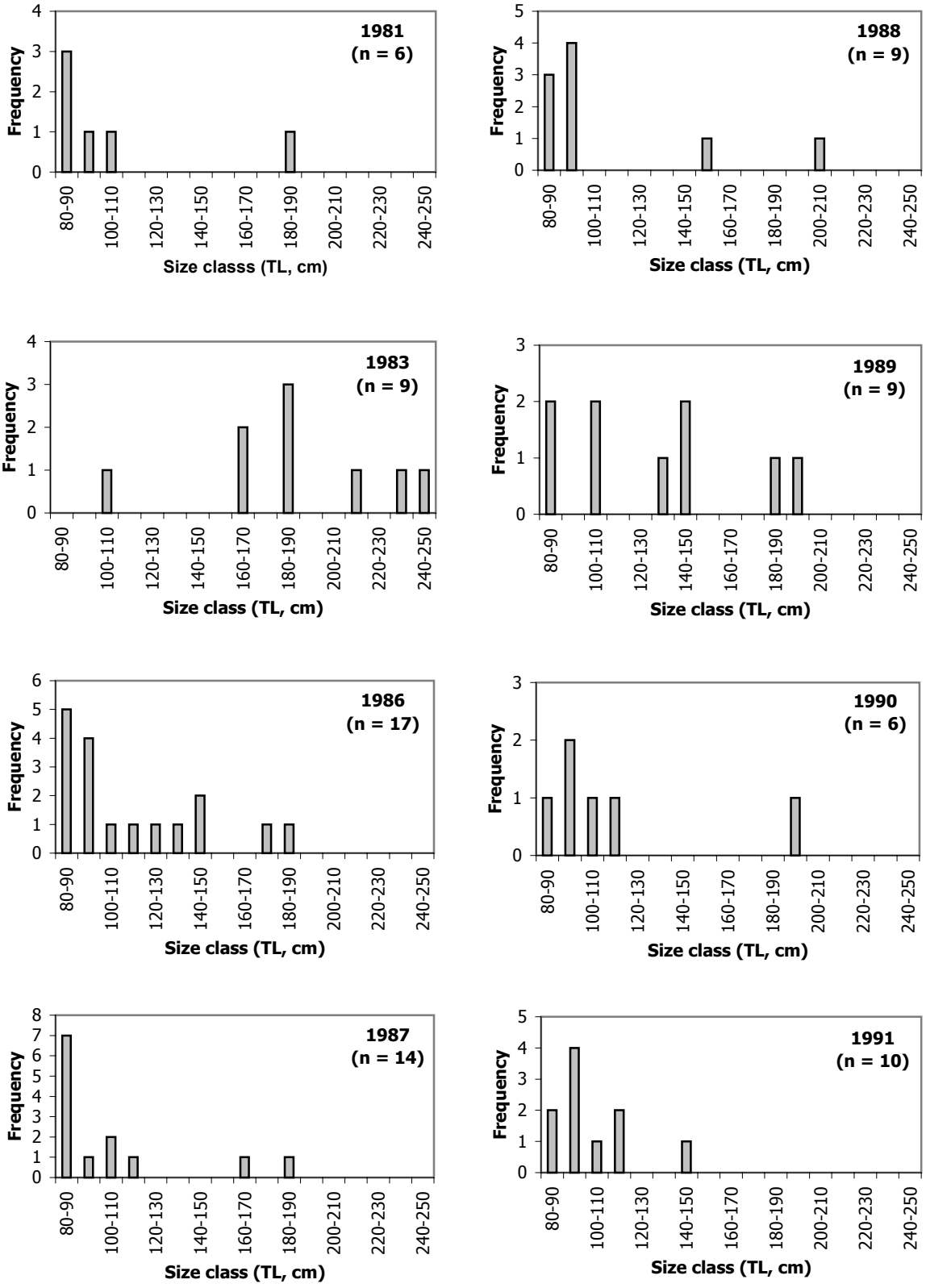


Figure 13: Length-frequency distributions for dusky sharks observed in the MRFSS. Only years where at least five sharks were observed are included. Note the different scales along the y-axes.

Dusky Shark
Marine Recreational Fisheries Statistics Survey

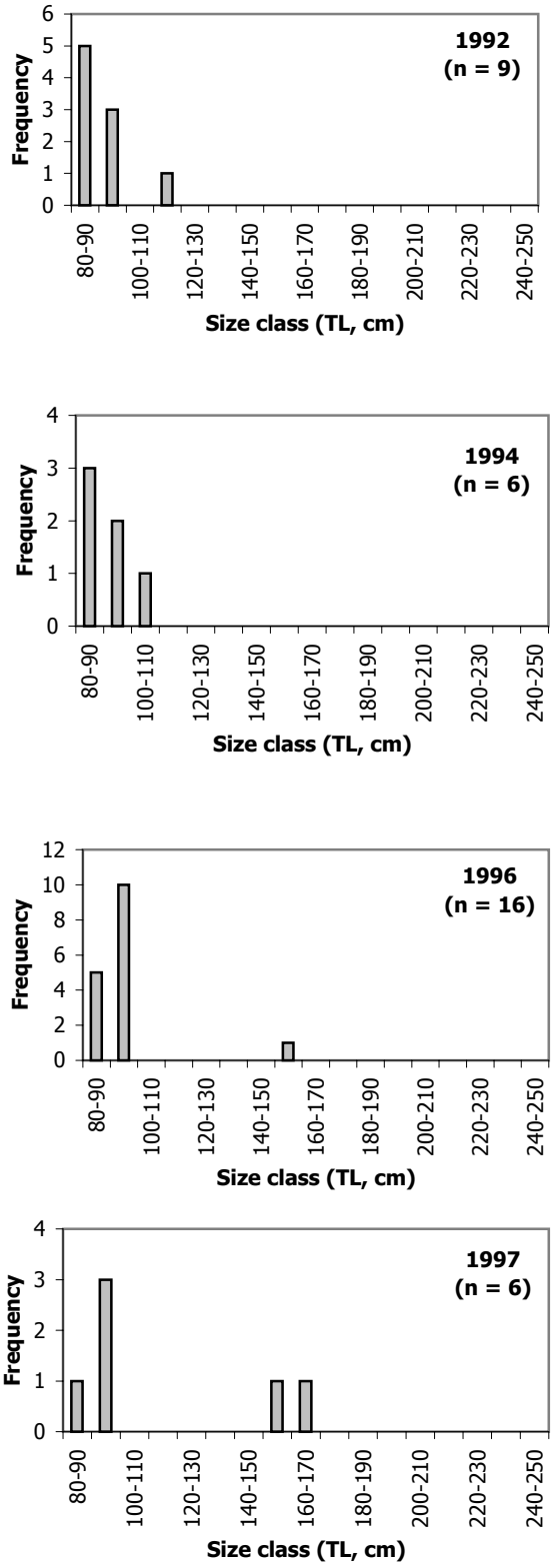


Figure 13 (cont): Length-frequency distributions for dusky sharks observed in the MRFSS. Only years where at least five sharks were observed are included. Note the different scales along the y-axis.

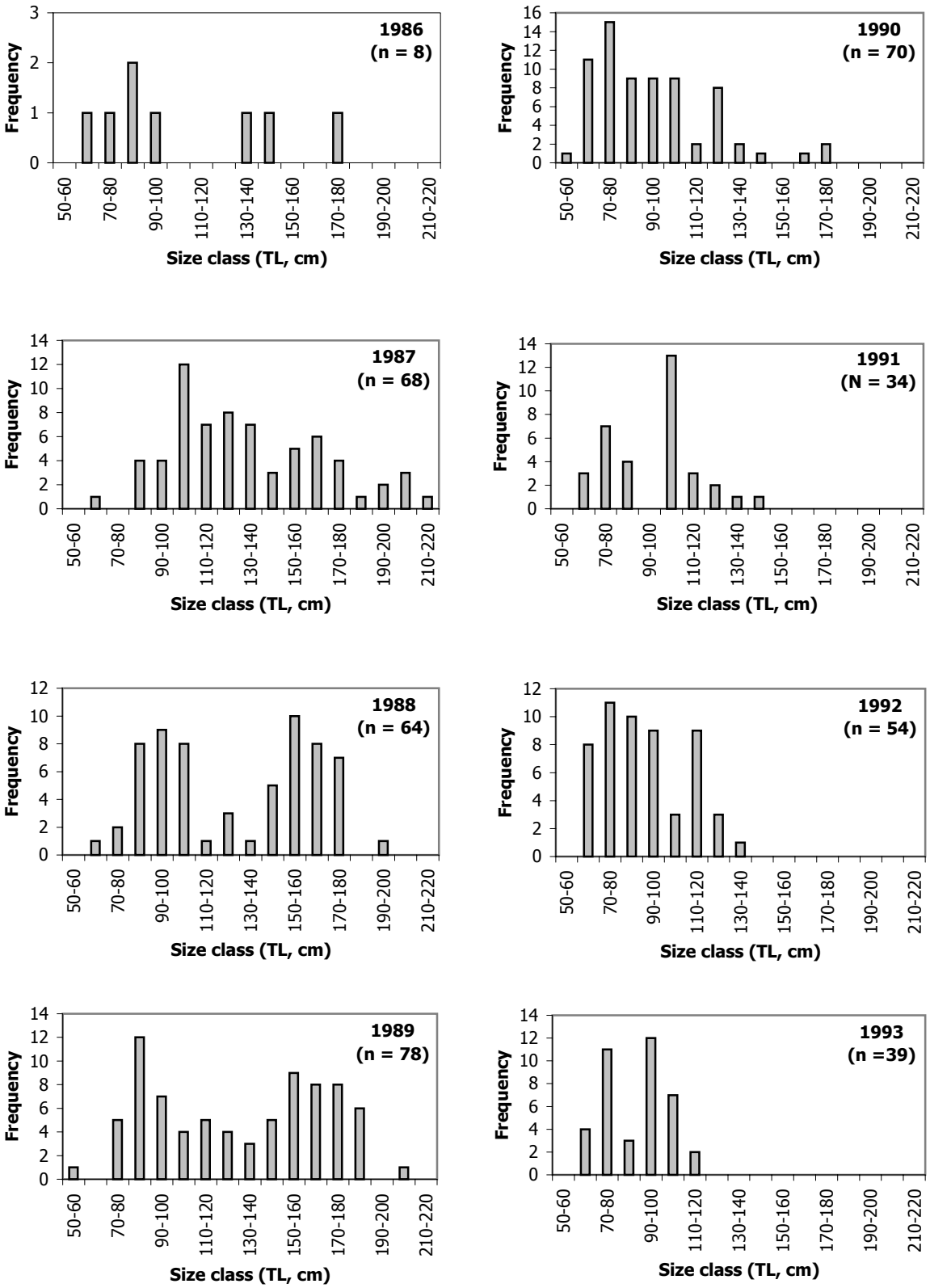


Figure 14: Length-frequency distributions for blacktip sharks observed in the Headboat Survey. Note the different scales along the y-axis.

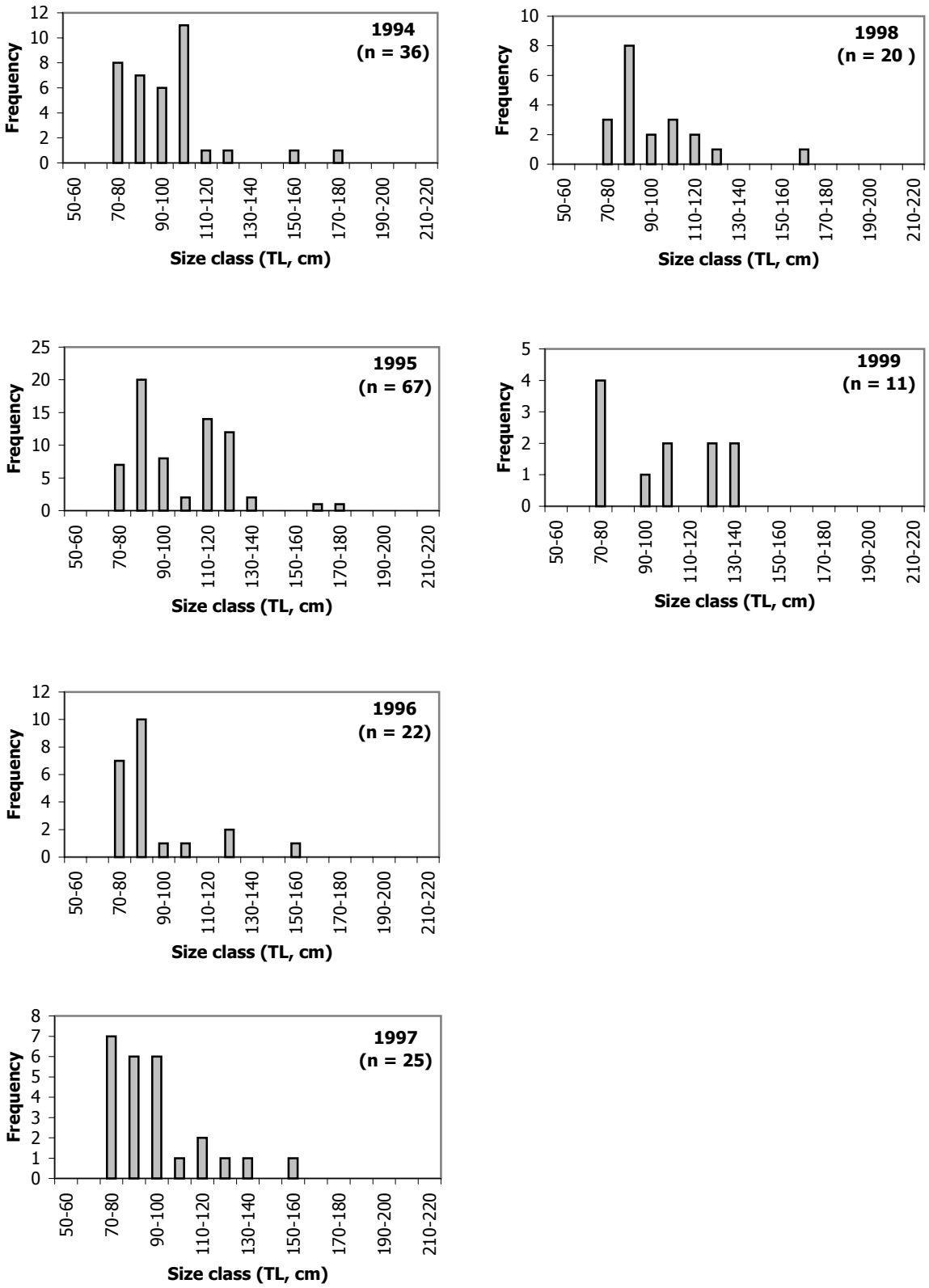


Figure 14 (cont.): Length-frequency distributions for blacktip sharks observed in the Headboat Survey. Note the different scales along the y-axis.

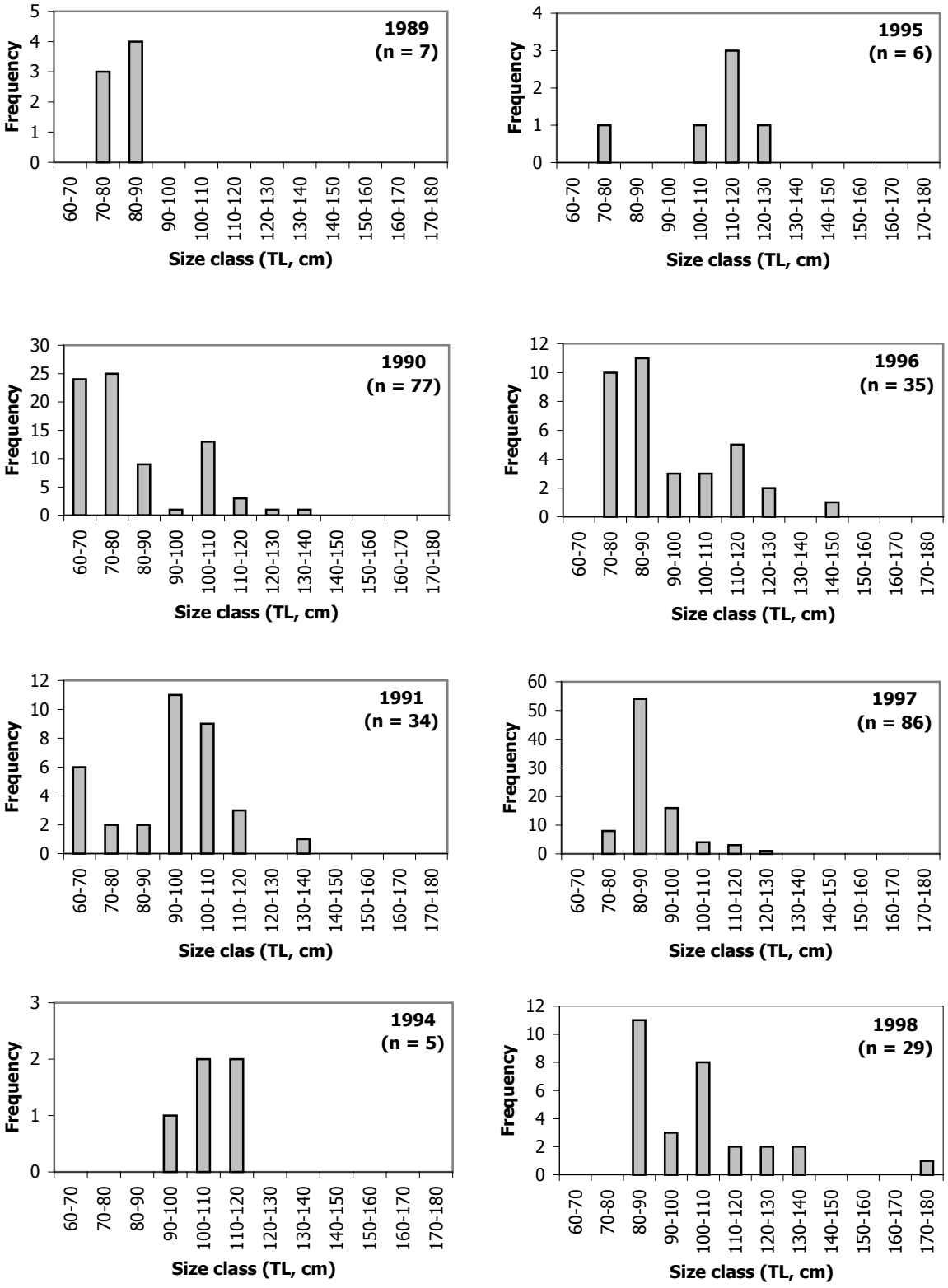


Figure 15: Length-frequency distributions for spinner sharks observed in the Headboat Survey. Only years where at least five sharks were observed are included. Note the different scales along the y-axes.

Spinner Shark
Headboat Survey

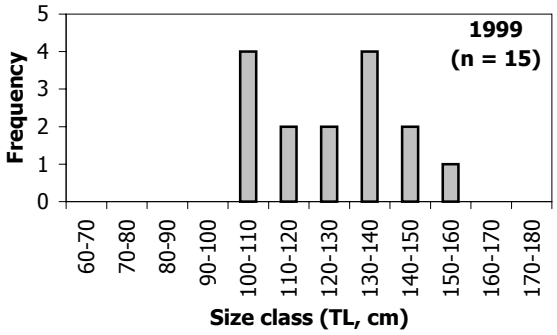


Figure 15 (cont): Length-frequency distributions for spinner sharks observed in the Headboat Survey. Only years where at least five sharks were observed are included. Note the different scales along the y-axes.

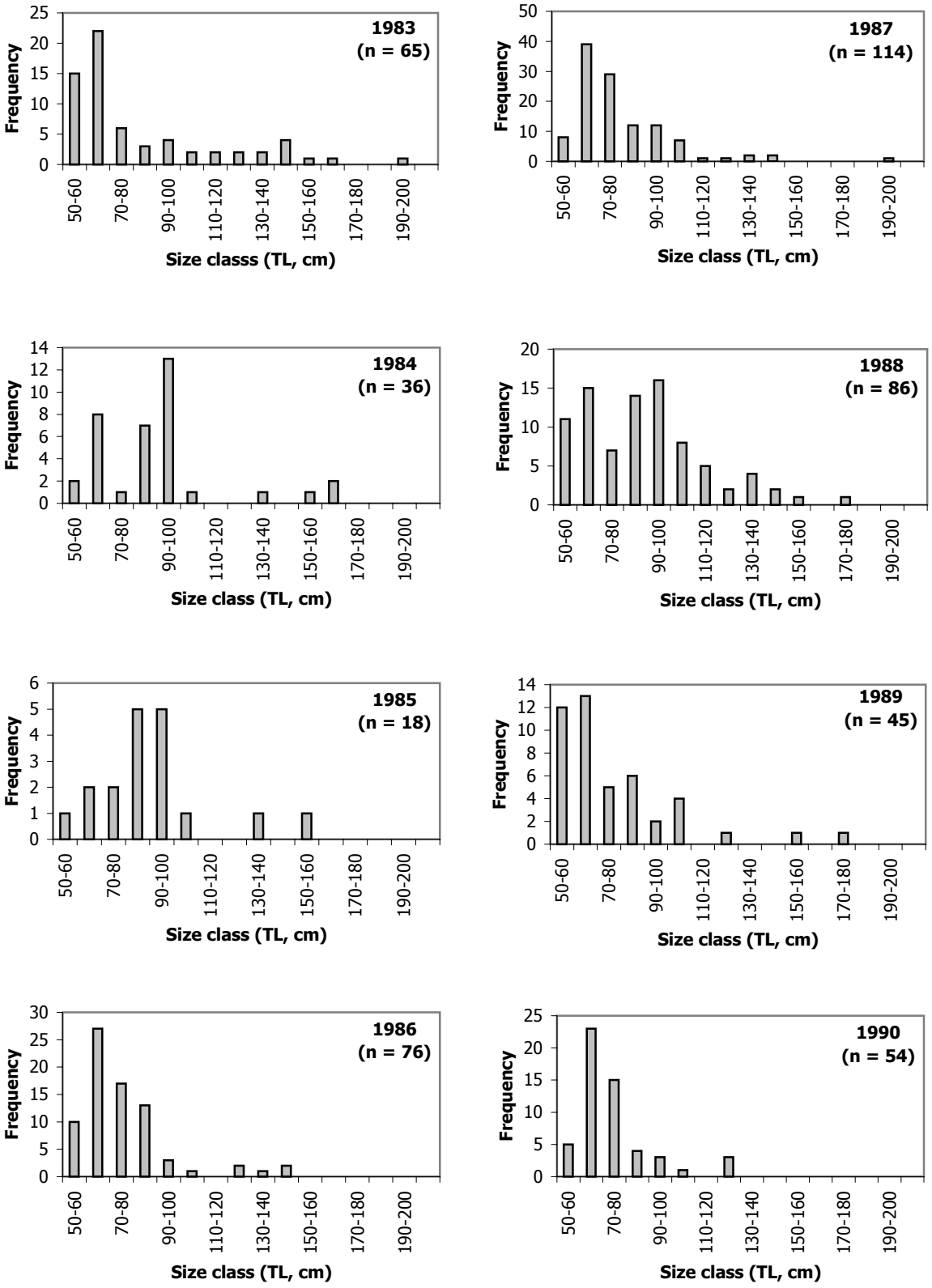


Figure 16: Length-frequency distributions for blacktip sharks observed in the Texas Parks and Wildlife Survey. Note the different scales along the y-axis.

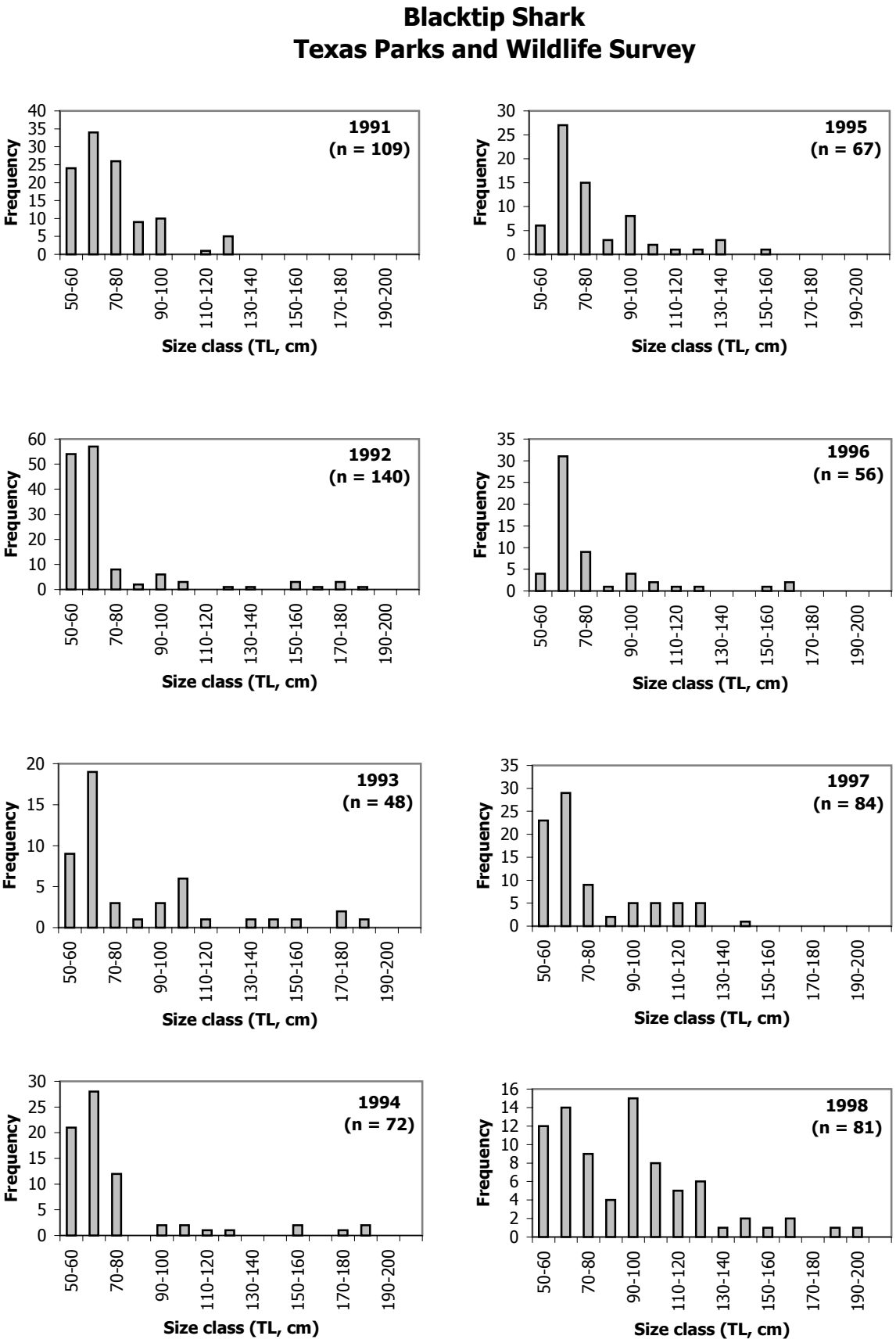


Figure 16 (cont): Length-frequency distributions for blacktip sharks observed in the Texas Parks and Wildlife Survey. Note the different scales along the y-axis.

Blacktip Shark
Texas Parks and Wildlife Survey

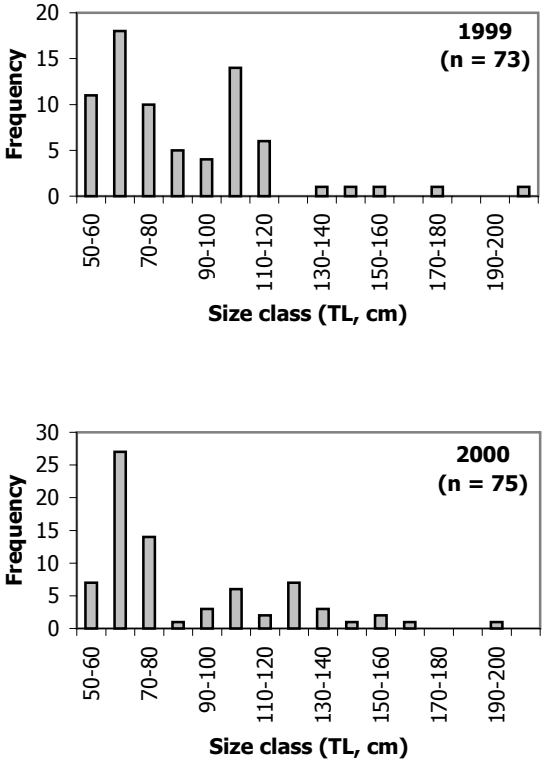
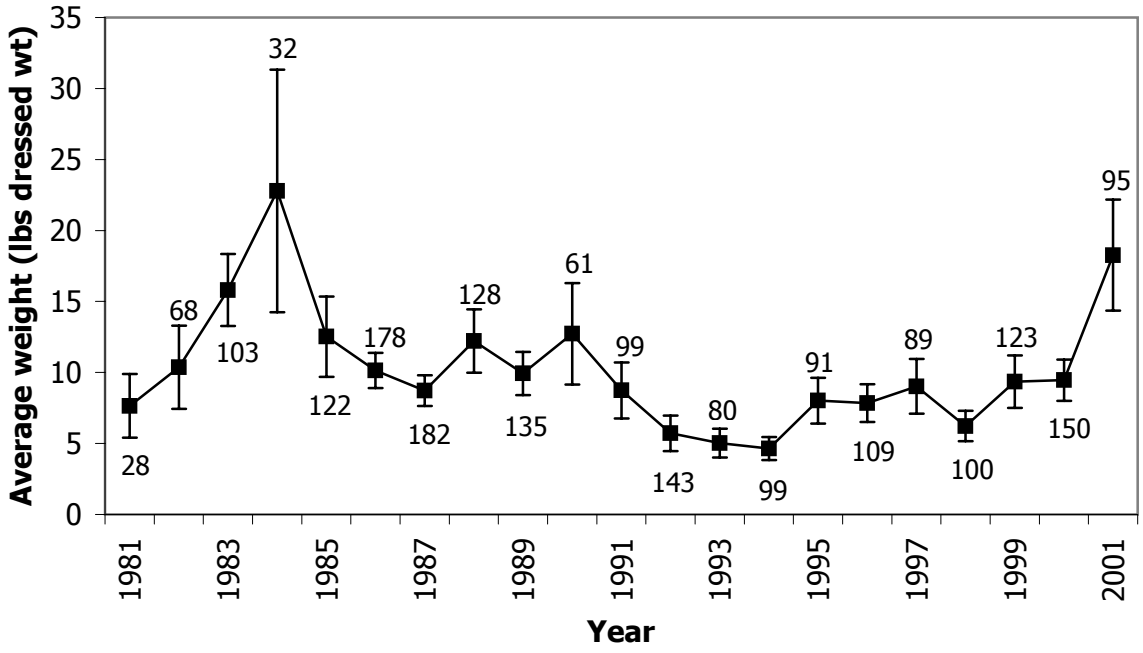


Figure 16 (cont): Length-frequency distributions for blacktip sharks observed in the Texas Parks and Wildlife Survey. Note the different scales along the y-axis.

Large Coastal Sharks
Marine Recreational Fisheries Statistics Survey

A.



B.

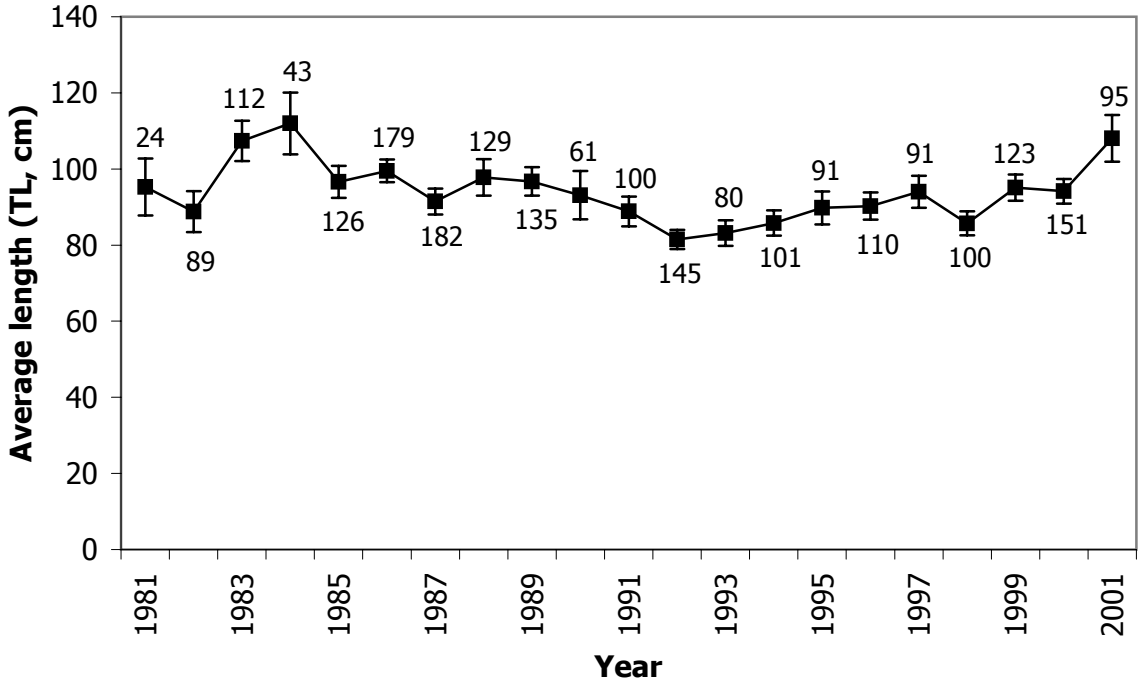
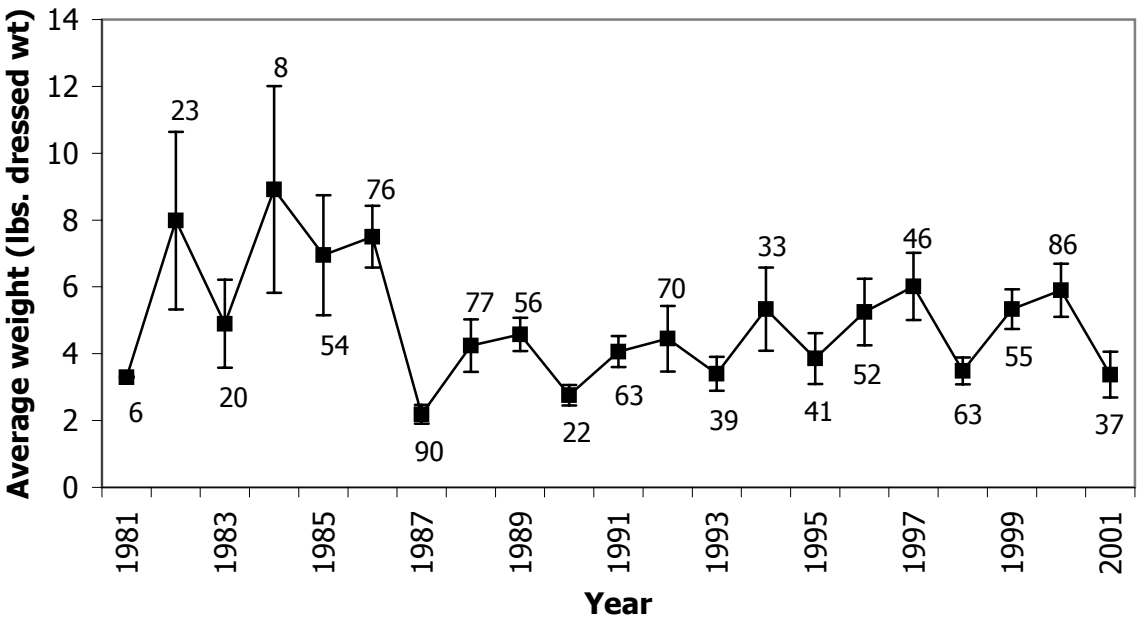


Figure 17. Average weight (A) and length (B) of large coastal sharks observed in the Marine Recreational Fisheries Statistics Survey. Error bars represent +/- one error; sample sizes are indicated.

Blacktip Shark
Marine Recreational Fisheries Statistics Survey

A.



B.

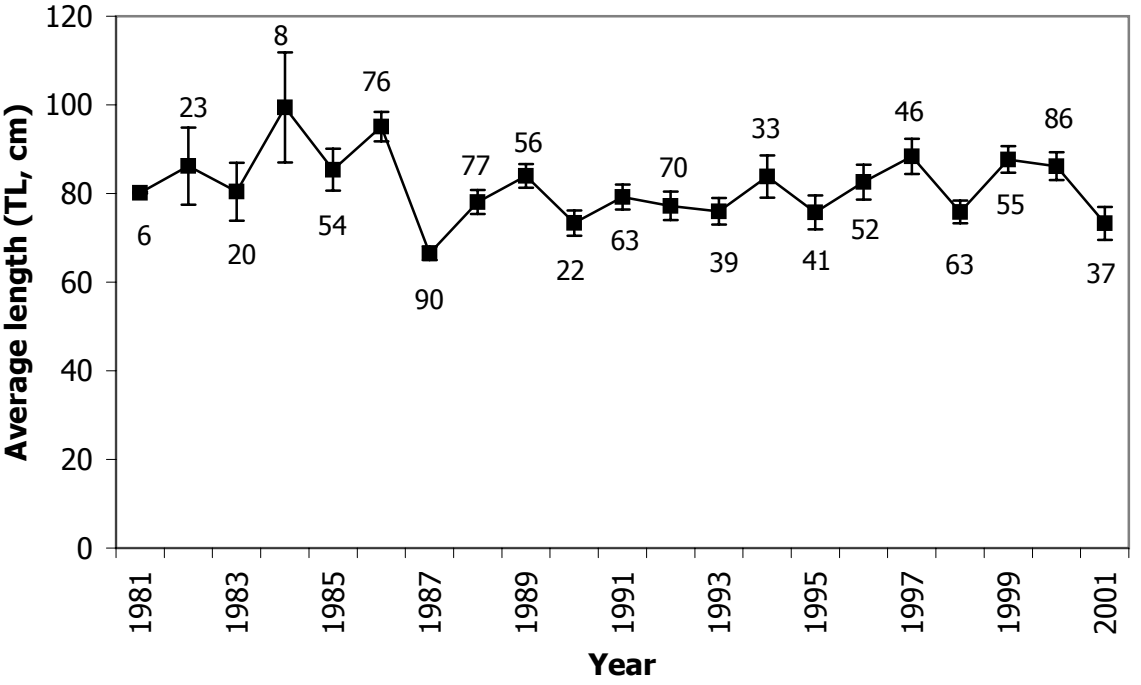
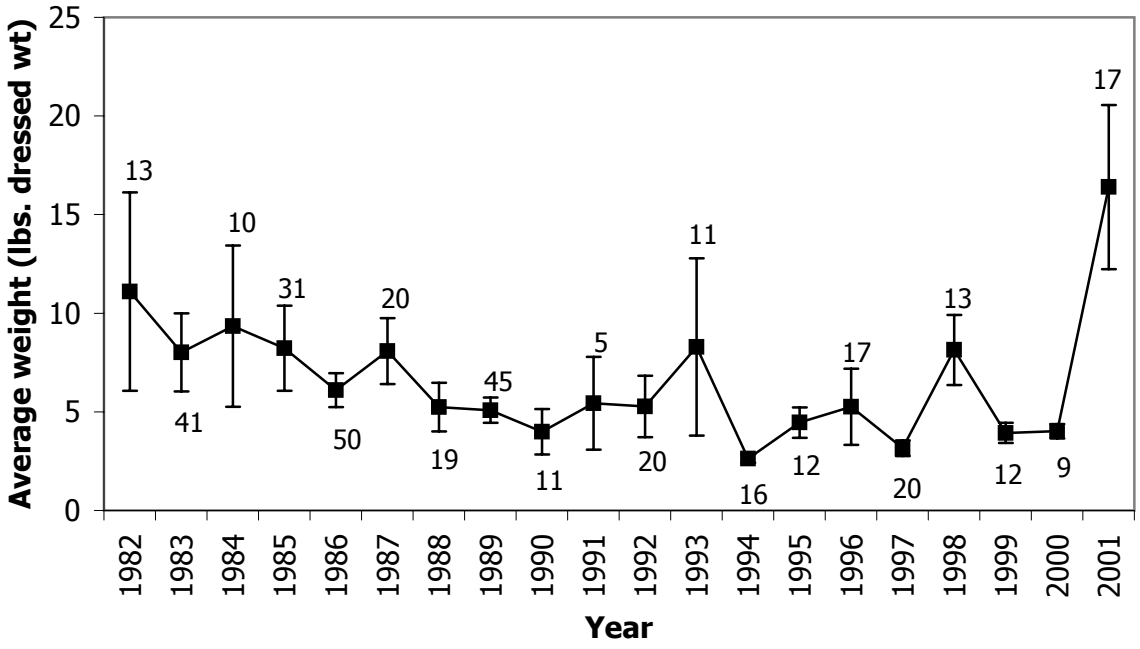


Figure 18. Average weight (A) and length (B) of blacktip sharks observed in the Marine Recreational Fisheries Statistics Survey. Error bars represent +/- one standard error; sample sizes are indicated.

Sandbar Shark
Marine Recreational Fisheries Statistics Survey

A.



B.

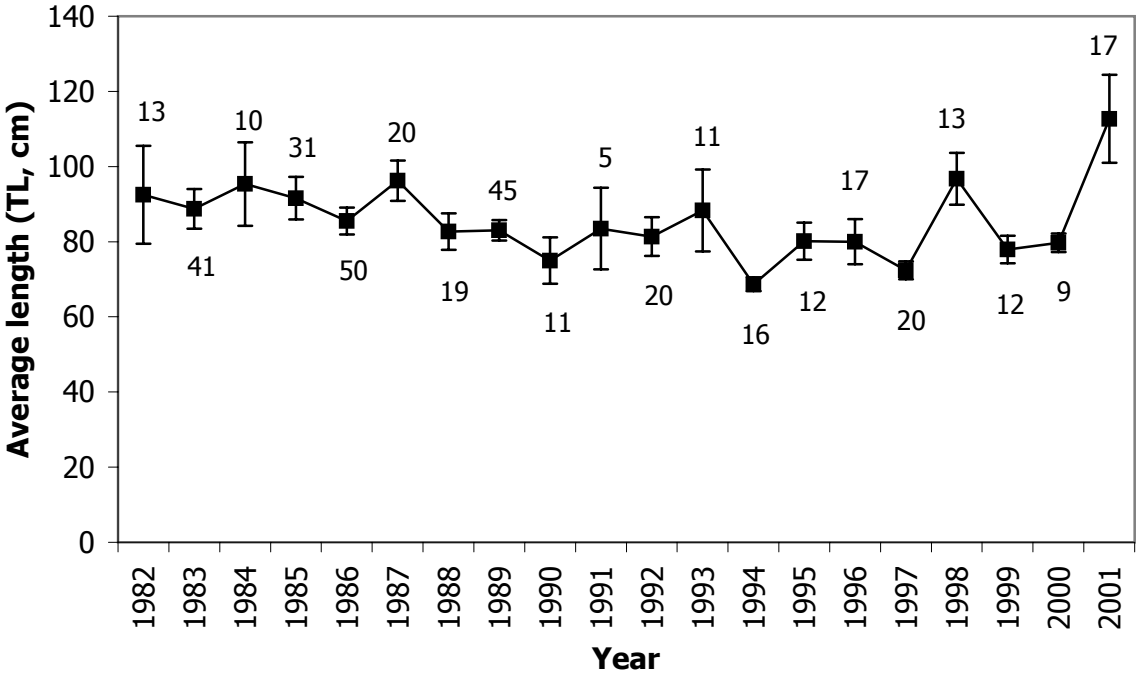
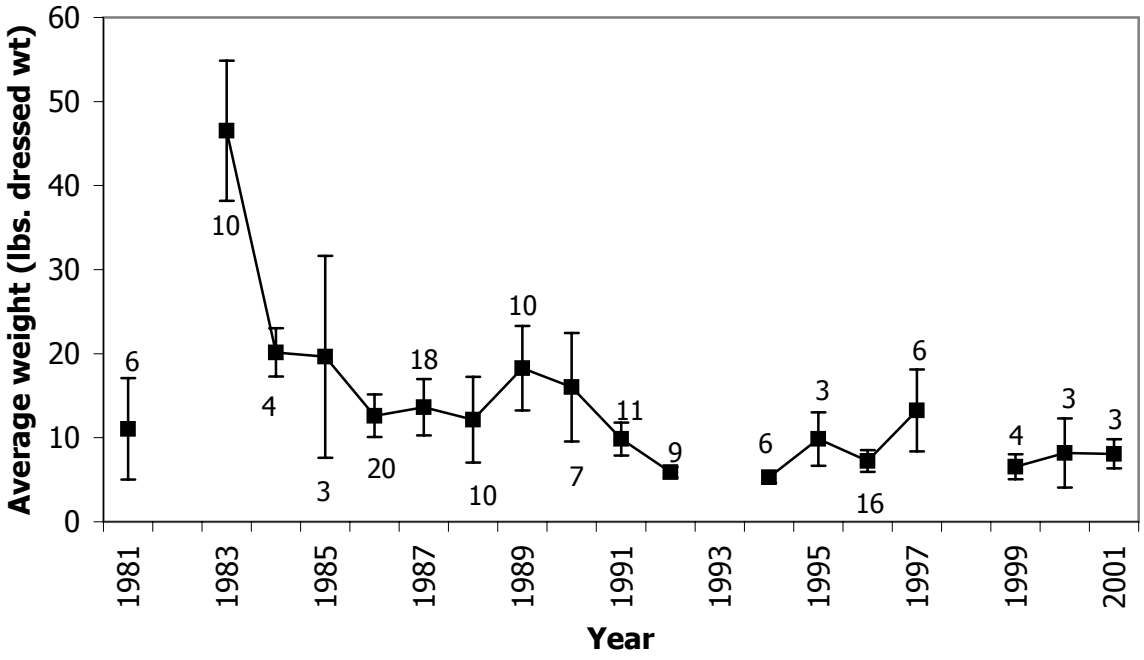


Figure 19. Average weight (A) and length (B) of sandbar sharks observed in the Marine Recreational Fisheries Statistics Survey. Error bars represent +/- one standard error; sample sizes are indicated.

Dusky Shark
Marine Recreational Fisheries Statistics Survey

A.



B.

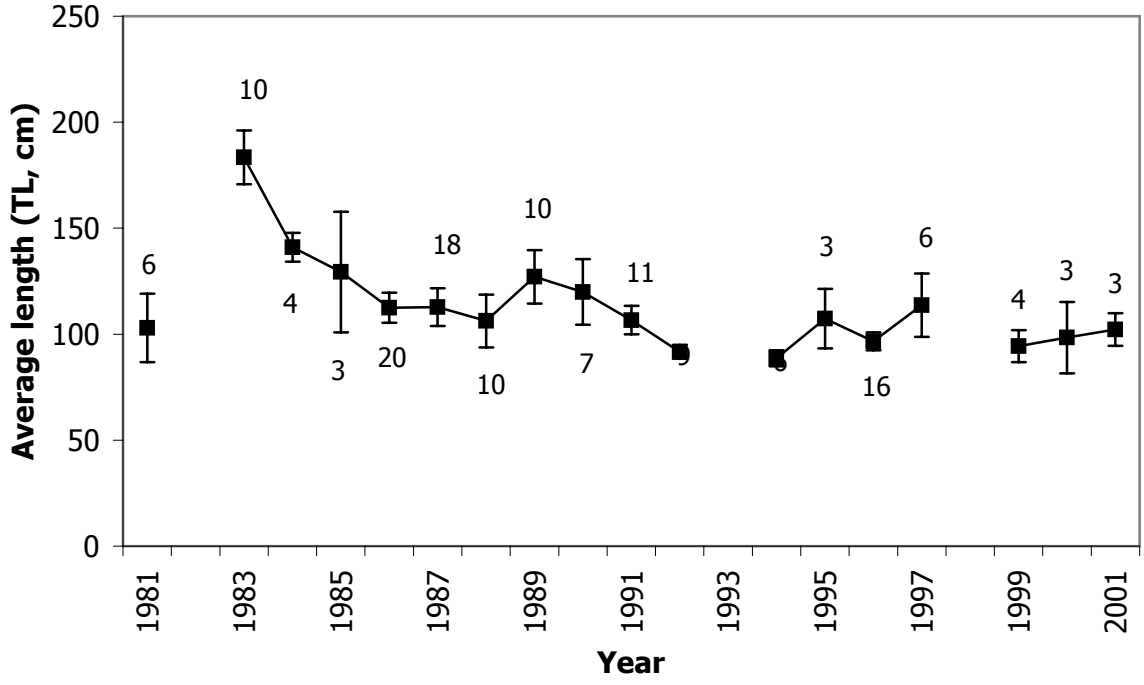


Figure 20. Average weight (A) and length (B) of dusky sharks observed in the Marine Recreational Fisheries Statistics Survey. Error bars represent +/- one standard error; sample sizes are indicated.

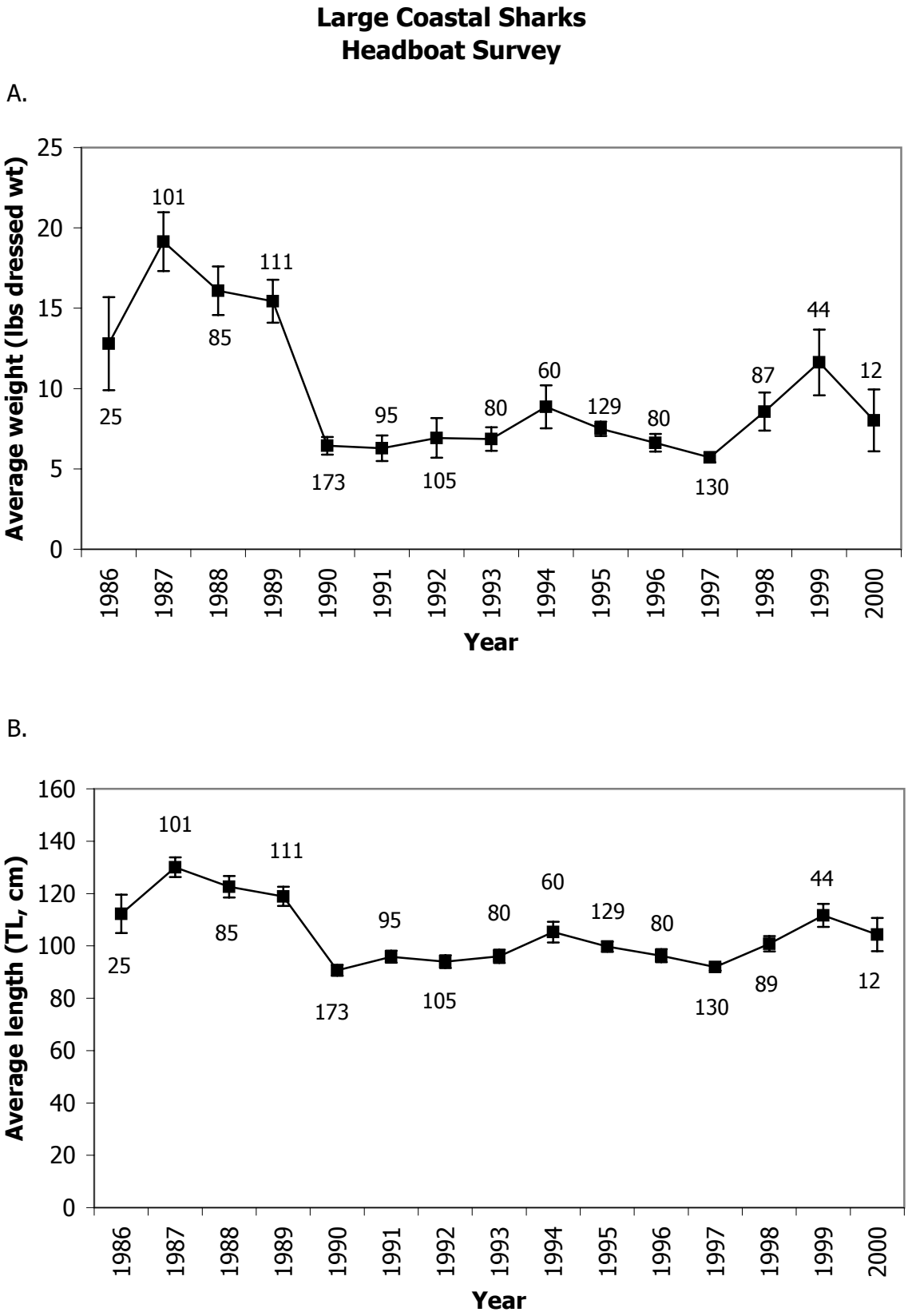


Figure 21. Average weight (A) and length (B) of large coastal sharks observed in the Headboat Survey. Error bars represent +/- one standard error; sample sizes are indicated.

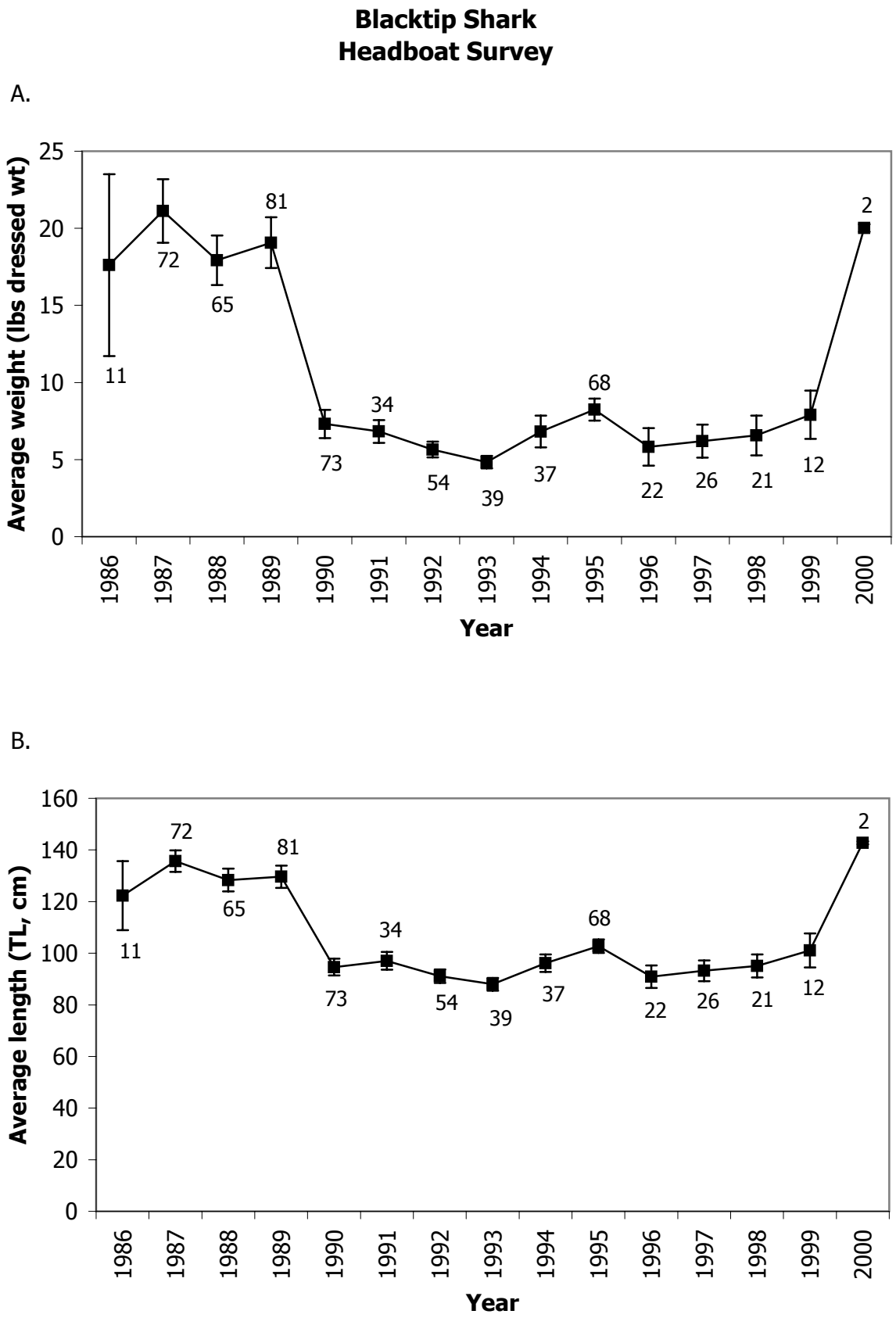


Figure 22. Average weight (A) and length (B) of blacktip sharks observed in the Headboat Survey. Error bars represent +/- one standard error; sample sizes are indicated.

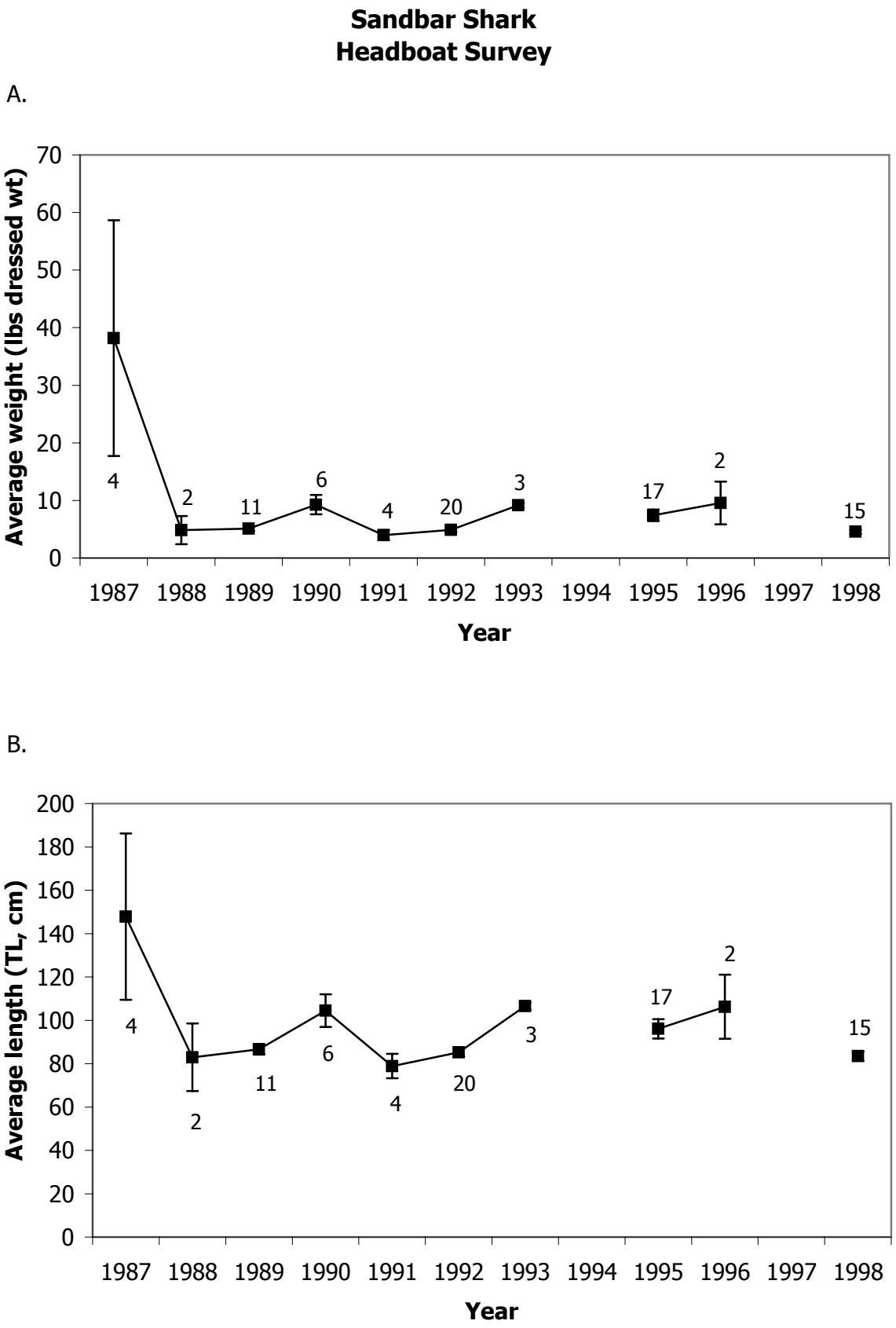


Figure 23. Average weight (A) and length (B) of sandbar sharks observed in the Headboat Survey. Error bars represent +/- one standard error; sample sizes are indicated.

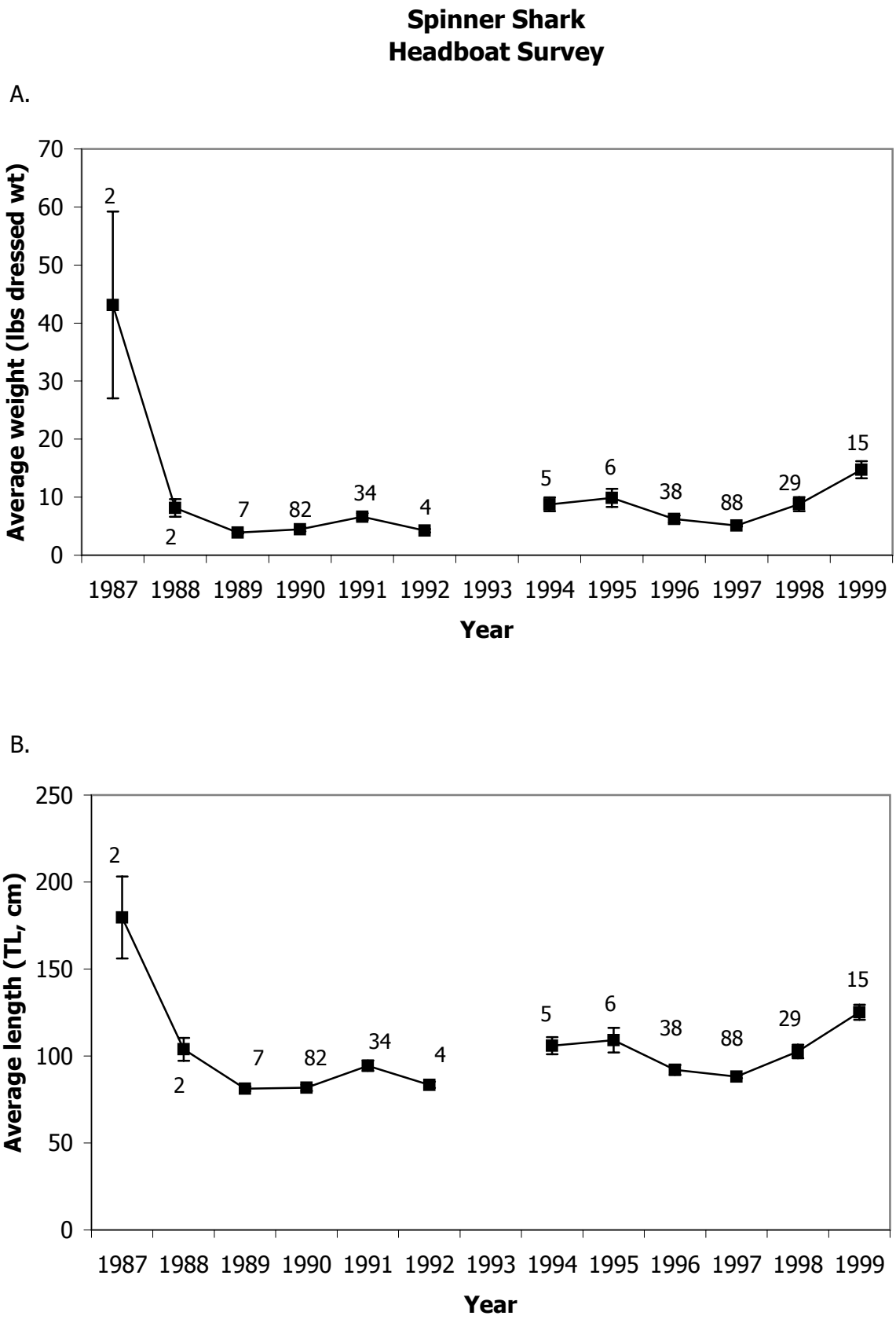


Figure 24. Average weight (A) and length (B) of spinner sharks observed in the Headboat Survey. Error bars represent +/- one standard error; sample sizes are indicated.

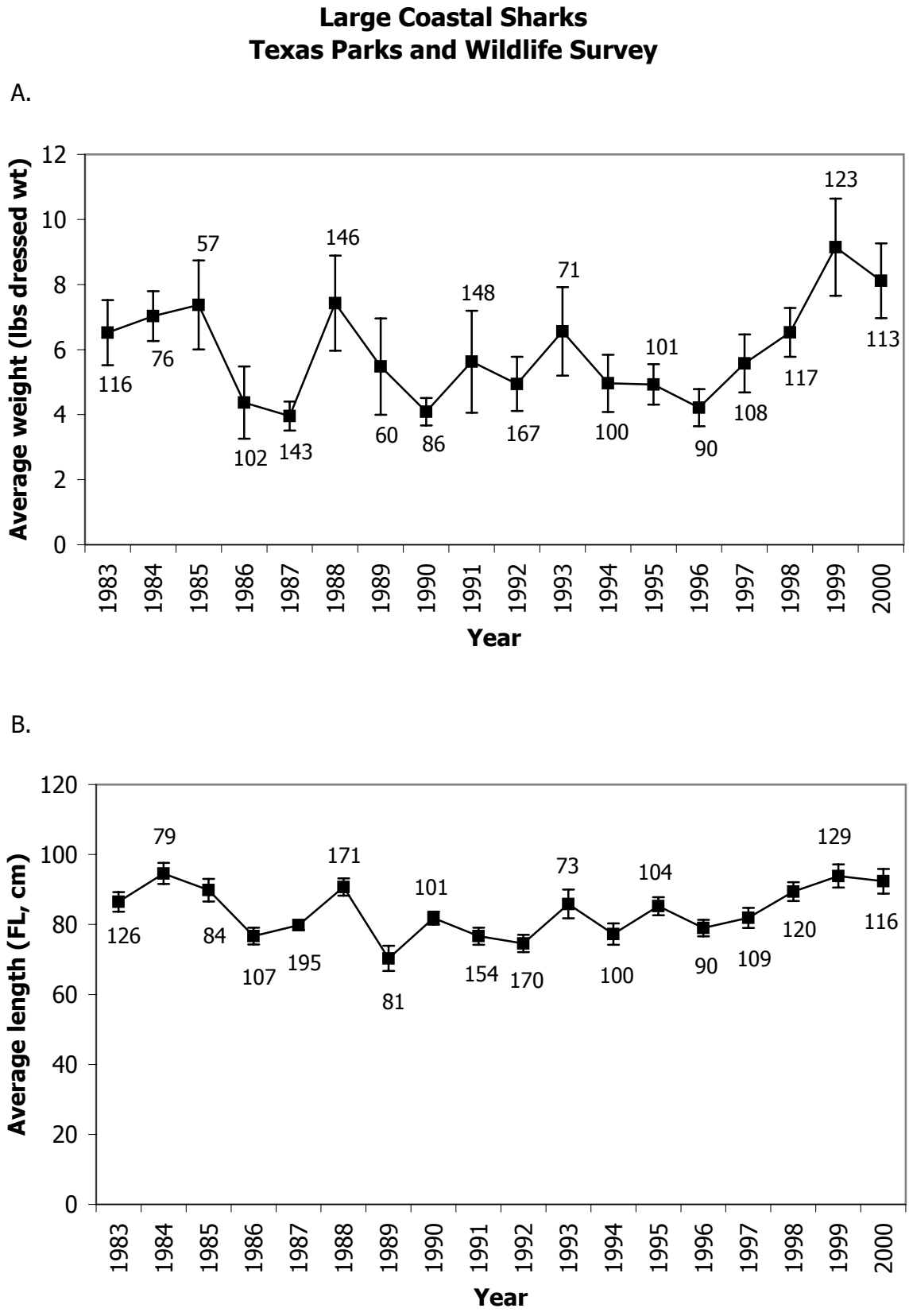


Figure 25. Average weight (A) and length (B) of large coastal sharks observed in the Texas Parks and Wildlife Survey. Error bars represent +/- one standard error; sample sizes are indicated.

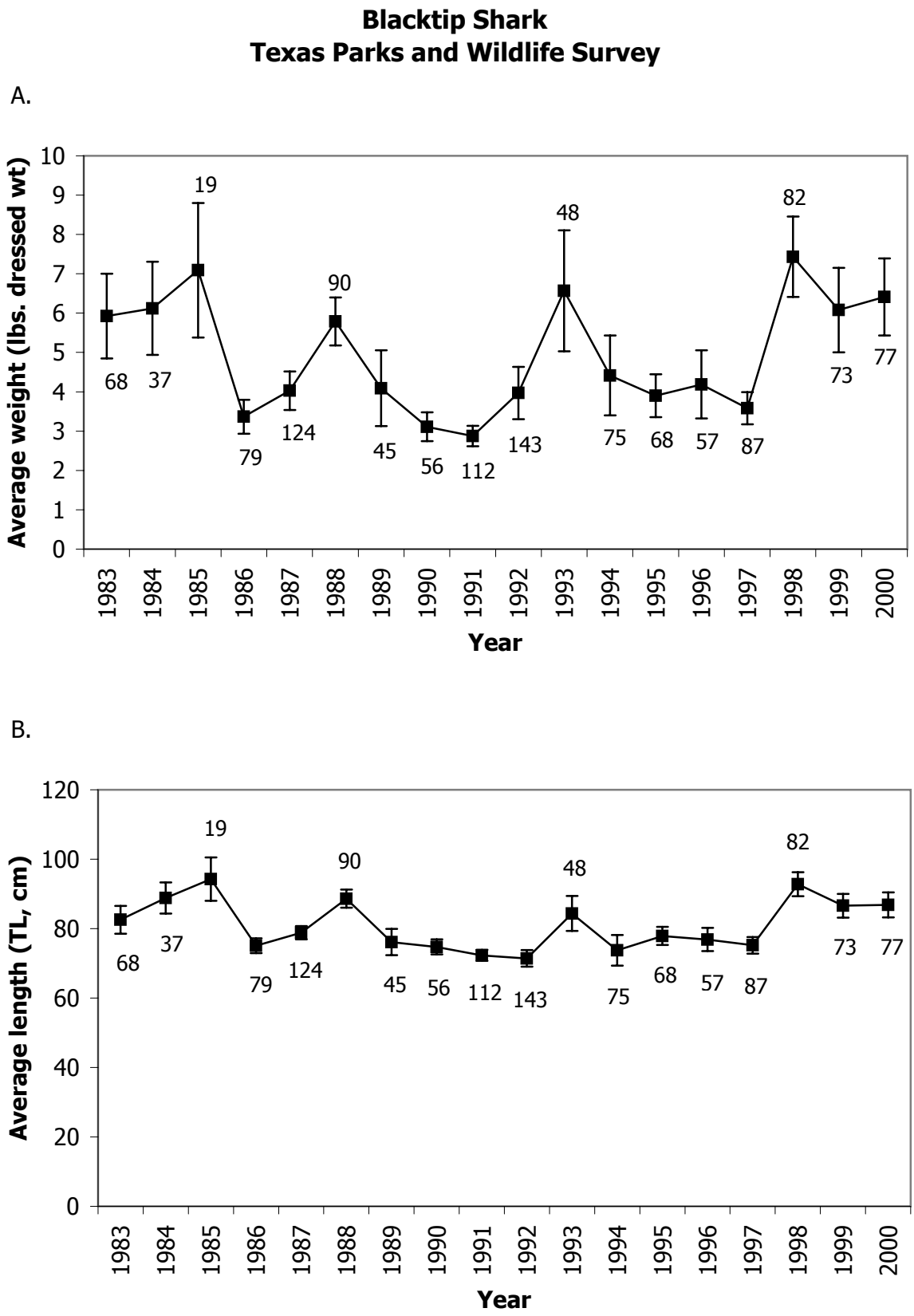


Figure 26. Average weight (A) and length (B) of blacktip sharks observed in the Texas Parks and Wildlife Survey. Error bars represent +/- one standard error; sample sizes are indicated.